Hood Canal Bridge East-Half Replacement Closure Mitigation Plan—Final Report

June 2003

Washington State Department of Transportation

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1.0 MITIGATION PLANNING PROCESS

1.1 Introduction

The Hood Canal Bridge will be closed for up to eight weeks in 2006

The Hood Canal Bridge carries State Highway 104 across Hood Canal, a natural, deep-water fjord located west of Puget Sound in Washington State (see Figure 1-1). The bridge connects the Olympic and Kitsap Peninsulas, serving as a vital link between Clallam and Jefferson counties and the urban centers of central Puget Sound. The bridge will be subject to a planned, eight-week, closure in 2006 for major work involving replacement of half the supporting structure and widening of the road surface.

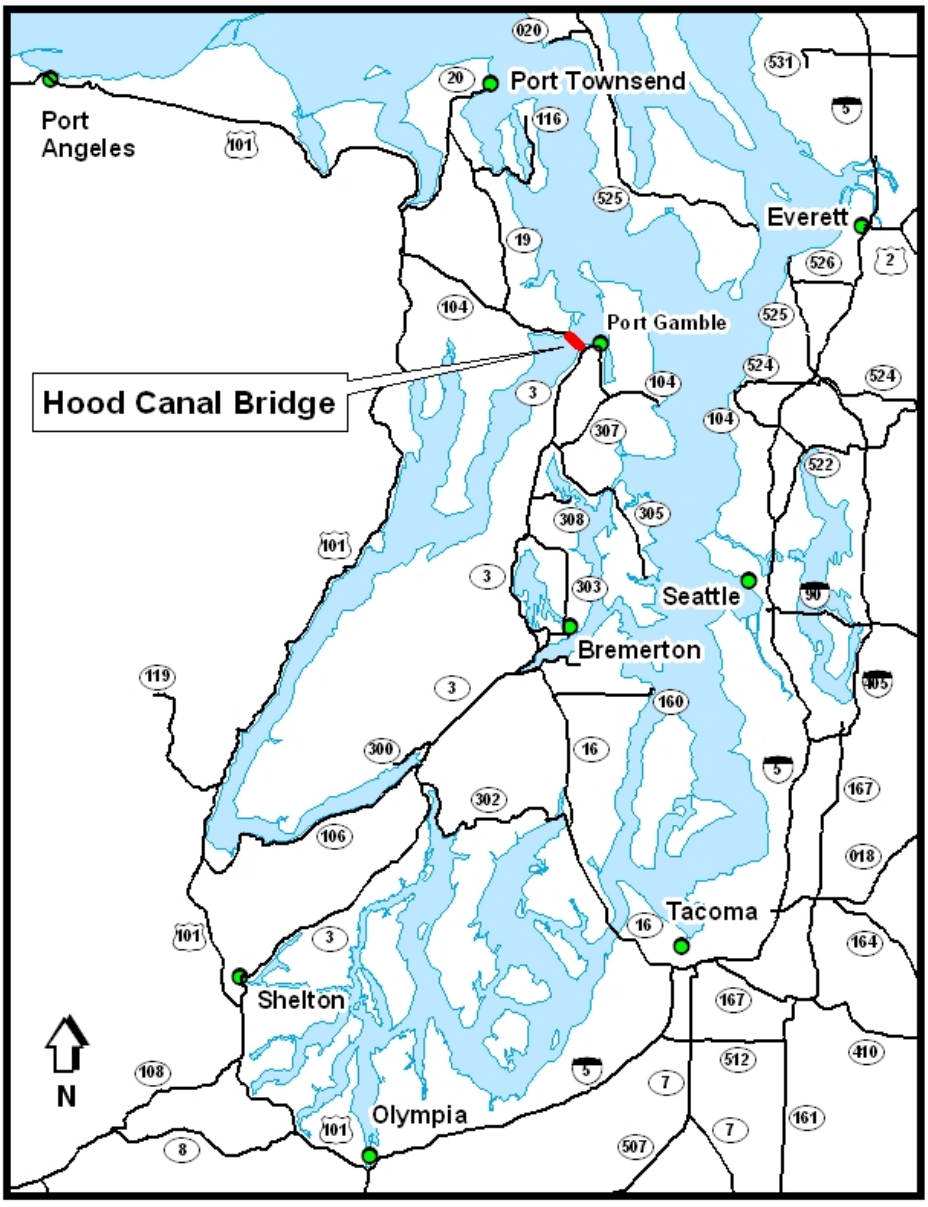
The goal of the Closure Mitigation Plan is to reduce the severity of the impact on the traveling public

As part of the design and permitting process of bridge replacement project, mitigation concepts were explored and considered for implementation. The goal of the mitigation program, as stated in the February 2000 report *Hood Canal Bridge East-Half Replacement Closure Mitigation Plan – Preferred Options* is to "reduce the severity of the impact of bridge closure on the traveling public, especially residents of the Olympic and Kitsap peninsulas." The Washington State Department of Transportation (WSDOT), in cooperation with the Peninsula Regional Transportation Planning Organization (PRTPO) worked to develop a closure mitigation plan to respond to the eight-week closure. The participation of the PRTPO in mitigation planning process stemmed from their recognition of the importance of the bridge and it is acknowledged role as a "vital link between the Olympic and Kitsap Peninsulas".

1.2 Method

A coalition of transportation stakeholders met to examine possible closure mitigation measures

The *Hood Canal Bridge East-Half Replacement Closure Mitigation Plan – Preferred Options* (or Preferred Options Report) documents over two years of mitigation planning process that was used to identify an initial list of mitigation activities, or "preferred options". In that process, project stakeholders were identified, and they convened in an effort to help WSDOT staff investigate and configure the essential elements of a closure mitigation plan. Their stated objective was to "develop a coalition of state, regional, local, and community partners to provide project guidance, and evaluate project alternatives." (Preferred Options Report, pg. 18). To achieve their objective, they first organized in two groups to achieve this objective - advisory (or technical), and executive (or stakeholder). The results of their alternatives evaluation was a list of preferred options, each one requiring a preliminary engineering assessment in order to determine its potential effectiveness and suitability to the mitigation task.


Port Townsend
Port Angeles
Everett
Port Gamble
Hood Canal Bridge
Seattle
Bremerton
Tacoma
Shelton
Olympia
N

The selection of preferred options, and preliminary engineering work that followed, was called the Closure Mitigation Plan (CMP) Phase I effort. That effort concluded in February 2002 with selection of the final mitigation strategies by the PRTPO Executive Council. The effort that followed, CMP Phase II was a detailed examination of the selected final strategies. The objective of Phase II was to define each final strategy, including the required facilities, services, and activities, in sufficient detail that contracts and specifications to implement the final strategies could be generated. This effort continues, and involves WSDOT staff, the PRTPO Executive Council, affected transit agencies, and other stakeholders whose interest and dedication insure that the impact of the bridge closure on travelers will be minimized to the greatest extent possible within the defined budgetary constraints. Figure 1-2 depicts the overall schedule for reconstruction of the bridge and development of the Closure Mitigation Plan.

Table 1-1 – Participants in the Closure Mitigation Process

Group Name	Abbreviation
Washington State Department of Transportation	WSDOT
Peninsula Regional Transportation Planning Organization	PRTPO
Project Management Team	PMT
Hood Canal Bridge Replacement Advisory Committee	Advisory Committee
Hood Canal Bridge Replacement Stakeholder Committee	Stakeholder Committee
PRTPO Technical Advisory Committee	TAC
Phase II workgroups (a.k.a. HCB Project Committee)	Project Committee
WSDOT Olympic Region Planning Office	OR Planning

1.2.1 Mitigation Plan - Phase I

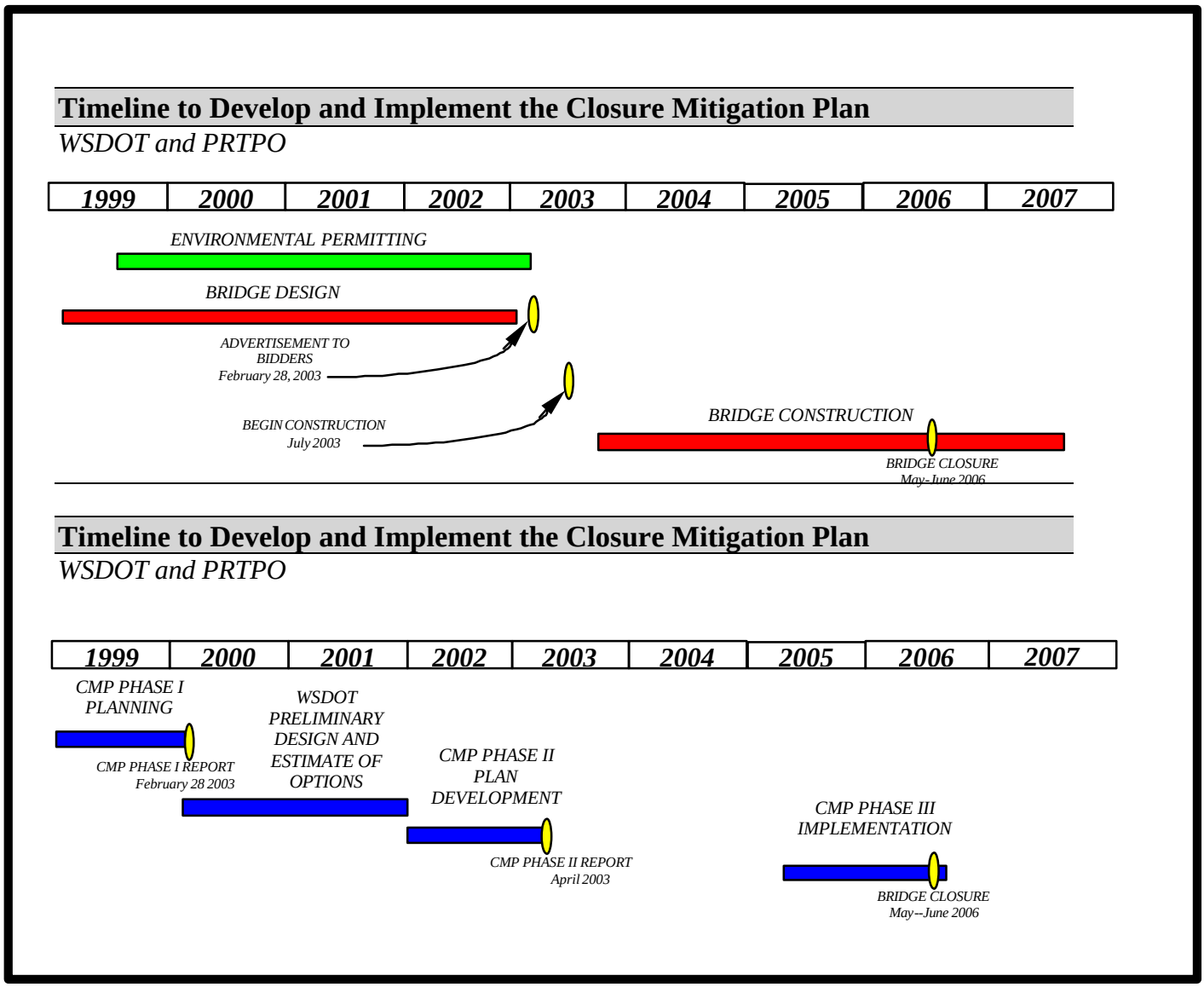
The Stakeholder's Committee selected eleven Preferred Options for study in December, 1999

The PRTPO was invited into the effort by WSDOT because of their regional and local transportation responsibilities and connection to local concerns. It was determined that their connection to local transportation concerns would be an efficient way to provide meaningful guidance about the impacts of the closure, and the potential effectiveness of proposed mitigation strategies.

In February 1999, they collaborated with WSDOT in forming the Hood Canal Bridge Replacement Advisory Committee (the Advisory Committee) and the Hood Canal Bridge Replacement Stakeholder Committee (the Stakeholder

Committee). The Advisory Committee worked as the technical lead, developing, screening, and recommending particular mitigation alternatives to the Stakeholder Committee. The Stakeholder Committee, in turn, was responsible for corresponding with the Advisory Committee and reviewing

Figure 1-2 – Timelines



their work. The Stakeholder Committee was also responsible for making recommendations to WSDOT about which alternatives represented their "Preferred Options" for mitigating the closure. The list of Preferred Options resulting from this process is shown in Table 1-2.

For more information about the mission and activities of the Advisory Committee, Stakeholder Committee, and how the Preferred Options were selected, see the Preferred Options Report.

An analysis of the Preferred Options focused on the implications of the proposed auto ferry services

After selection of the Preferred Options by the Stakeholder Committee in December 1999, a team led by the PMT conducted an analysis of the selected options. Their analysis involved preliminary engineering studies, benefit cost analysis, and other investigations, and was performed by WSDOT at the direction of the PRTPO. The purpose of this analysis was to determine which strategies among the Preferred Options would be most effective at mitigating travel disruptions during the closure. The focus of the analysis was a detailed investigation about the implications and costs of those Preferred Options requiring additional ferry service during the closure.

At the September 14, 2001 PRTPO Executive Council meeting, the PMT presented the results of their examination of the Preferred Options. Their list of seven of the most effective preferred options included:

?? Passenger only ferry service between Southpoint and Port Gamble
?? Car ferry service from Port Townsend to Kingston and Edmonds
?? Construction of a northbound and a southbound passing lane at Mount Walker on US 101
?? Signage at key decision points
?? Public outreach
?? Rideshare program
?? Program to assist those with medical needs across Hood Canal

The Project Committee advised the PRTPO Executive Council on the most effective mitigation strategies

Interested participants were selected at that meeting to serve on project workgroups that would help coordinate the design and specification of these seven strategies. The workgroups were organized based on three areas of interest: Port Townsend, Transit/Ferry, and Medical.

As more information about the cost of implementing the selected mitigation strategy became apparent during the fall of 2002, the PMT determined that one of the two most expensive strategies (the Passenger Only Ferry – Hood

Table 1-2 – Stakeholder's Committee Phase I Preferred Options

1.	Consider initiating **Port Townsend to Edmonds car ferry service** to facilitate leisure, commuter, business, medical and commercial trips between the Olympic Peninsula and King County.
2.	Consider initiating **Port Townsend to Kingston car ferry service** to facilitate leisure, commuter, business, medical and commercial trips between the Olympic Peninsula and the Kitsap Peninsula.
3.	Consider initiating **Port Townsend to Seattle passenger only ferry** and increase transit service between existing Park and Ride lots of ferry terminal to facilitate leisure, commuter, business, medical and commercial trips between the Olympic Peninsula and Seattle.
4.	Consider providing **passenger only ferry service across Hood Canal** between Lofall and South Point, enhancing existing Park and Ride facilities, or building new facilities within fifteen minute radius of the ferry terminals and providing shuttle service between the canal, the Kingston ferry terminal and the Park and Ride facilities. This option would facilitate a percentage of the leisure, commuter, business and medical trips that are currently served by the bridge.
5.	Consider **enhancement of the US101 Corridor** by improving existing pullouts and adding passing lanes to facilitate those bridge users who would choose to travel around the canal rather than use ferry service.
6.	Consider providing a **freight barge across Hood Canal** to facilitate commercial trips between the Kitsap and Olympic Peninsulas.
7.	Consider implementing a **Hood Canal Bridge Closure Rideshare Program** (e.g. real time ride matching, vanpool program around canal, worker/driver buses around canal, shared vehicles at Park and Ride locations) to facilitate leisure, commuter, and medical trips.
8.	Consider **installing signs at decision points leading to the Olympic Peninsula** to notify drivers of the Hood Canal Bridge closure and suggest alternate routes. Signs shall be strategically placed to address all Hood Canal Bridge users.
9.	Consider initiating a **Hood Canal Bridge public outreach program** that includes a multi-faceted public relations program and outreach to cities, counties, chambers of commerce, and public services. Public outreach shall focus on all users and communities affected by the bridge closure.
10.	Consider **providing subsidized medical flights** between the Olympic Peninsula and Kitsap County or Seattle area.
11.	Consider **subsidized housing and/or motels** for commuter and medical trips that cannot be adequately accommodated" by any other option.

Canal and the Auto Ferry – Port Townsend to Kingston and Edmonds) had to be eliminated in order to stay within budget. It became the first task, therefore, of the three selected workgroups to convene as a single Project Committee to help determine the best course of action to insure that the mitigation project stayed within budget.

This Project Committee and the PMT met on February 1, 2002 to discuss the facts surrounding the selection of a list of Final Strategies that would adhere to the mitigation project budget. The Project Committee ultimately determined that the list of Final Strategies for mitigation should not include the Auto Ferry – Port Townsend to Kingston and Edmonds strategy. Their work concluded with the selection and endorsement of a list of Final Strategies for mitigation. This list was forwarded to the PRTPO Executive Council for their approval.

The analysis of, and comparison between, the various Preferred Options that led to the selection of the list of Final Strategies, is described in Chapter 2.

1.2.2 Mitigation Plan - Phase II

Six Final Strategies were selected for implementation by the PRTPO in February 2002

Phase II of the Mitigation Plan was initiated when the six Final Strategies recommended by the Project Committee were approved by the PRTPO Executive Council on February 8, 2002. These Final Strategies are:

?? Assistance with medical needs through the development of a Transportation Medical Association (TMA) and telemedicine opportunities
?? Construction along US 101 to upgrade and prepare the highway for use as an alternate route and the primary freight route during bridge closure.
?? Work with transit agencies to create/increase rideshare opportunities.
?? Public outreach and advance signing.
?? Close bridge early in the season and keep the closure as brief as possible.
?? A passenger only ferry between South Point and Port Gamble

The goal of the Phase II work was to develop the actual design and specification of services and facilities that would ultimately be required to fulfill the objectives of each Final Strategy. A description of the work involved in this effort, and the progress made to date, are described in Chapter 4.

2.0 PHASE I - PREFERRED OPTIONS

2.1 Committee Recommendations

The Preferred Options were studied by WSDOT to determine their viability and likelihood of success

During Phase I the Stakeholder Committee, with input and concurrence from the Advisory Committee, adopted a list representing the preferred mitigation alternatives (or options) for addressing impacts to the traveling public that would occur as a result of closing the Hood Canal Bridge during the East Half Replacement project (See Preferred Options, Pg 36). This list of Preferred Options is shown in Table 1-2. At that time, WSDOT was directed by the Committee to analyze each option in a "pre-design" level of detail, including benefit/cost analysis (both in construction and mitigation implementation), and make a determination, based on this analysis, of each option's viability and likelihood of success.

2.2 Analysis of the Preferred Options

The PMT directed an effort to analyze the eleven solutions proposed by the Stakeholder Committee. This effort involved the cooperation of separate and joint committees of interested representatives from the PRTPO, as well as the PMT. These groups studied costs, benefits, impacts, and potential configurations of the preferred options.

2.2.1 Auto Ferry – Port Townsend to Kingston and Edmonds

Auto ferry service would require significant improvements near the terminals, while benefiting comparatively few travelers

The proposal for an auto ferry operation between Port Townsend and Edmonds or Kingston consolidates the first two recommendations of the Stakeholder Committee, preserving the intention that an optimum auto ferry service be considered as part of the mitigation plan. This option involves shore side boat operations, as well as landside improvements and operations that support the terminal. An analysis was performed on both of these possible routes.

Additional ferry service departing and arriving at Port Townsend, Edmonds, and Kingston would require the introduction of significant landside upgrades. The analysis identified a range of possible improvements that might accompany the introduction of this service in each of these locations. The most significant changes identified are found at the Port Townsend terminal. The improvements investigated and documented include the addition of offsite areas for holding over 200 vehicles waiting to board, including tollbooths and toilet facilities. Improvements also included siting, construction of park and ride improvements for between 800 and 1200 vehicles at various locations, as well as the associated transit services, and improvements required to serve the facility.

It was determined that the Closure Mitigation Plan could support only one ferry strategy

On February 1, 2002, the PMT presented to the Project Committee the results of the analysis of the auto ferry option. In considering this option, they recommended that routing be limited to Port Townsend/Kingston routing for the ferry, since this would allow for four sailings per day instead of three when Edmonds is included. The focus of the meeting, however, was the need to select one option for mitigation transportation: the Port Townsend Auto Ferry or the Hood Canal Passenger Only Ferry. It was determined through the course of research that

these two options were nearly equivalent in cost (about $6.5 million). The need to select one over the other was necessitated by the relatively high cost of these two options. Eliminating one would allow the mitigation project to stay within its budget.

The PMT concluded that the Hood Canal Passenger Only Ferry provided benefit to the greatest number of users, and recommended its selection as a Final Strategy. See Table 2-1 for the comparison of relative advantages and disadvantages associated with each of these services. The Project Committee concurred with the PMT's conclusion, and determined not to recommend further consideration of the Port Townsend to Edmonds and Kingston Auto Ferry option to the PRTPO Executive Council.

2.2.2 Passenger Only Ferry - Port Townsend to Seattle

The Victoria Clipper Company currently owns the franchise for passenger ferry service between Seattle and Port Townsend

This passenger only ferry (POF) option was first examined during discussions with the Washington State Ferries (WSF) operations staff about the impact of docking the required boats at their existing passenger only facility near Coleman Dock (Seattle Pier 50). WSF indicated at that time that significant changes to their operations at this facility would be required in order to accommodate the new service.

The Victoria Clipper Company currently holds a franchise with the Utilities and Transportation Commission for providing ferry service between Port Townsend and Seattle. When the service is operating, they dock at their own facility at Seattle Pier 69. They do not currently provide any service on this route. According to Darrell Bryan, Executive Vice President and General Manager, the company's position on exercising this franchise during the closure is that it would be too risky economically. However, they have not ruled out the possibility of licensing other operators who want to assume the risk and service this run for that limited period of time, or entering into discussions with WSDOT in an effort to develop other alternatives. Data from the *1998 Hood Canal Bridge Origin and Destination Study* (O&D Study) shows that the volume of Hood Canal Bridge traffic bound for the eastern shore of Puget Sound is not significant compared to that bound for Kitsap and Olympic peninsulas. One summary of these results indicates that a significantly higher percentage of bridge trips are between the Olympic and Kitsap Peninsulas (50% of trips) as compared to those between the Olympic Peninsula and the Seattle area (20% of trips) (see Table 2-1).

Table 2-1 – A Comparison between the Volume of Traffic between the Olympic Peninsula, Kitsap Peninsula, and the Seattle Area*

Origin/Dest	Kitsap Peninsula		Seattle Area	
	Kingston/Poulsbo	Bremerton	Seattle	Bellevue/S. King County
Pt Ludlow	13%	10%	3%	2%
Pt Towns	7%	9%	4%	2%
Sequim/P	4%	7%	6%	3%

A				
Total	24%	26%	13%	7%
Destination Summary	50%		20%	

**Taken from "Results of the 1998 Hood Canal Bridge Origin and Destination Survey", Table 3.11*

A significantly larger proportion of bridge travelers are served by the Hood Canal ferry route.

Based on the O&D analysis, and the situation at Coleman Dock, the PMT concluded that this type of service would not provide significant benefit to the average bridge user, and could lead to significant disruption at the WSF operation. The Project Committee concurred, and determined not to recommend further consideration of the Seattle Passenger Only Ferry option to the PRTPO Executive Council.

2.2.3 Passenger Only Ferry – Hood Canal

The South Point landing location is favorable for transfers and docking vessels on the west shore of Hood Canal

The terminals at South Point and Lofall were used during the previous bridge closure from 1981-1982. These terminals accommodated a small vehicle vessel at that time. The examination of requirements for this option in the current effort focused on the significant landside development related to delivering and supporting passenger service, including long term parking facilities and ADA compliant passenger transfer systems.

On the west side of Hood Canal, it was found that the South Point location would be suitable as a passenger only facility. Required improvements surrounding the terminal would include four, five-piling dolphins, a 9600 square foot floating dock, two-110 foot gangways, 800 square foot platform, and a short connecting bridge or trestle. Transit facilities and amenities would be located adjacent to the terminal, but long-term parking would require siting at a remote location. The existing Shine Gravel Pit, located nearby, was identified to be improved as a park and ride serving between 800 and 1200 vehicles. A short dedicated transit line would transfer passengers between the terminal and the parking area.

Space restrictions preclude the use of terminal sites at Lofall, Barge Road, and Salisbury Park

On the east side of Hood Canal, several possible landing sites were examined (See Figure 2-1). It was determined that the former Lofall ferry terminal was too small to accommodate the parking required for the operation. In addition, the existing terminal facilities would have to be upgraded substantially to provide for adequate service there. The best offsite parking option, at the nearby WSDOT maintenance facility, would be insufficient to fulfill the expected volume. Constraints at the shore are such that there is insufficient space to provide for the turning movements associated with the standard 40-foot buses expected to serve offsite parking.

Identified, as possible landing sites were the existing barge terminal and Salisbury Park, both immediately adjacent to the Hood Canal Bridge, as possible landing sites for the passenger ferry. Neither site has sufficient space to accommodate the parking required. These sites are also both limited by Section 4(f) constraints, due to their status as public recreation accesses. Significant environmental impact due to boat activities and construction fill were also noted.

The ready feasibility of the nearby Port Gamble site precluded further investigation and evaluation of these issues.

Port Gamble offers sufficient space for docking, transfers, and parking vehicles

The Port Gamble site enjoys a significant level of existing dock and landside improvements. Unlike the other sites, adequate parking and transit space is found immediately adjacent to the dock. Because of its location, this terminal would require ferry trips to pass through the bridge construction area. Based on subsequent communications between the PMT and the bridge designers it was determined that no slowdown in ferry operations through this area should be expected.

During their February 1, 2002 to the Project Committee, the PMT presented the case that the passenger only service serving Hood Canal would be more effective as a mitigation strategy than the Port Townsend Auto Ferry. The Project Committee concurred, and decided to recommend the PRTPO Executive Council approve the South Point/Port Gamble Passenger Only Ferry option as a Final Strategy. See Table 2-2 for a summary of the issues presented to the workgroups in support of their decision.

Table 2-2 - Comparison of Port Townsend Auto Ferry and Hood Canal Passenger Only Ferry -

Port Townsend Auto Ferry	Hood Canal Passenger Only Ferry
Advantages	***Advantages***
Would better accommodate tourist traffic.	Move more passengers during the AM peak than the Port Townsend Auto Ferry.
Uses all-weather boats.	Frequent service (every 20 minutes).
Automobile and trucks could be accommodated.	Impact of equipment failure reduced by availability of other boats on route.
Temporarily improves auto-holding facilities at Port Townsend.	Less traffic and construction impact in Port Townsend.
Disadvantages	Spacious parking areas available at Shine Pit and Port Gamble.
Long wait between boats.	More capacity to accommodate traffic impacts at Shine and Port Gamble than at Port Townsend.
One boat means the route is more vulnerable to equipment breakdowns.	Loading and unloading smaller boats is more compatible with logistics of temporary measures and facilities.
Requires reservations system.	***Disadvantages***
Overloads Port Townsend loading infrastructure.	Boats are more vulnerable to weather shutdowns.
Requires transit system that could accommodate 1400 passengers per sailing.	No auto or truck capacity.
Requires holding area that could accommodate 1400 passengers per sailing.	Requires people to change their auto routine.
Only 10% of daily bridge traffic is accommodated.	
Freight interests have indicated a preference for stockpiling and using alternate routes.	

US 101 improvements considered include pullouts, bridge widening, and passing lanes

2.2.4 US 101 Corridor Improvements

US 101 is the primary alternate route during the closure. It has the most excess capacity and provides the most direct land route for the majority of bridge users. Improvements to this highway corridor contemplated during initial formulation of alternatives included the installation of passing lanes, improvement of existing pullouts, and widening of bridges (called choke points) in an effort to increase safety and total vehicle throughput. The most

prominent passing lane location discussed by the PMT was the north and south approaches to the height of land west of Mount Walker near milepost 300.

According to information gathered at four public meetings held in early fall 1999, and reported to the Stakeholder Committee at their October 15th meeting in that year, the most important improvements to the US101 corridor were related to fixing bridge problems. In their October 21 meeting, the Advisory Committee suggested accelerated deterioration of the US101 surface should be expected due to increased traffic loads. At that same meeting, the PMT promoted the use of coordinated programming efforts that would direct timely department funding of priority US101 projects in preparation for the closure. Subsequent discussions by the PMT with interested groups indicated that department funding would most likely be limited to the current priority project in the corridor, the addition of passing lanes on Mount Walker.

During their February 1, 2002 to the Project Committee, the PMT recommended that US101 Corridor Improvements, specifically the addition of passing lanes on Mount Walker, be made a part of the mitigation plan. The Project Committee concurred, and recommended the PRTPO Executive Council approve this option as a Final Strategy.

2.2.5 Hood Canal Freight Barge

A freight barge was considered by the Advisory Committee, Stakeholder Committee, and at public meetings held in the fall of 1999. Feedback from these groups and those interested in how a service like this would function suggested that a reservation system would be required, that round the clock service would be useful, and that the heaviest demand would be during the early morning hours. Despite the heavy volume of goods involved, there was some indication that stockpiling of certain goods could be accomplished, and that this would serve to reduce traffic loads.

The possibility of employing a small (2 vehicle) barge between Barge Road in Kitsap County and South Point was investigated. The assumption was that an existing service in the San Juan Islands could relocate during the closure to serve the Hood Canal using existing shore side facilities at these locations. Their conclusion was that 88 vehicles could be served per day (daylight hours only). However, since this represents less than 10% of the expected freight vehicle volume between the Olympic and Kitsap peninsulas, the PMT determined that the benefits of this option were insignificant. Based on this analysis, the PMT did not promote the freight barge as a Final Strategy at the February 1, 2002 meeting of the Project Committee. The Project Committee concurred, and did not recommend that the PRTPO Executive Council approve this option as a Final Strategy.

2.2.6 Rideshare Program

During the October 21, 1999 Advisory Committee meeting, the project engineer explained that the rideshare program, information signing, and public outreach sparked little interest with either the stakeholder committee or the public during their reviews. However, he

Rideshare improvements have sparked little interest but are expected to be low cost

recommended to them that they include it in their final recommendations to the Stakeholder Committee anyway, since they involve relatively low cost activities, and they would most likely be done anyway. The committee agreed and did forward these elements in their final transmittal to the Stakeholder Committee.

Because of the low cost and potentially significant and positive impact of a rideshare program, the PMT promoted this option at the February 1, 2002 meeting of the Project Committee. The workgroups recommended this option approved as a Final Strategy by the PRTPO Executive Council.

2.2.7 Information Signing

Information signing has sparked little interest but is expected to be low cost

The provision of specific information signing during the closure did not receive a lot of interest by the public or the Stakeholder Committee. However, after discussions with the PMT, the Advisory Committee accepted the signing option and the Stakeholder Committee included it in the preferred options list. No further study of the feasibility or advisability of this option was performed or required, since this type of activity is commonly made a part of projects like this. It involves relatively little cost and holds potentially significant and positive impacts. The PMT promoted this option at the February 1, 2002 meeting of the Project Committee. The Project Committee concurred, and recommended that the PRTPO Executive Council approve this option as a Final Strategy.

2.2.8 Public Outreach Program

Early discussions about a public outreach program for the closure centered around discovering lessons learned from the I-5 Columbia River crossing closure (see Advisory Committee March 29, 1999 meeting). An interest in targeted medical outreach activities was documented at the Stakeholder Committee June 9, 1999 meeting, with the specific purposes of identifying the potential for directing consumers about rescheduling voluntary procedures, and communicating news about possible temporary services in Jefferson or Clallam County.

Public outreach activity in support of mitigation did not receive a lot of public input as a priority, nor did the Stakeholder Committee according to the discussion at their October 21, 1999 meeting emphasize it. However, the Stakeholder Committee approved this option after discussions with the PMT that focused on the relatively low cost of such an effort, and that public outreach activities are always normal practice and a priority during such WSDOT projects. Based on this analysis, the PMT promoted this option at the February 1, 2002 meeting of the Project Committee. The Project Committee concurred, and recommended that this option be approved as a Final Strategy by the PRTPO Executive Council.

2.2.9 Subsidized Medical Flights

Discussions held in 1999 concerning the need for medical transportation by the Stakeholder Committee and Advisory Committee; indicate a passionate interest in the issue among the members. Some of the issues raised at that time were:

?? The need to consider outreach strategies
?? Preferred providers (including military) are necessitating bridge crossings
?? A subsidized transit-based solution would be the most appropriate
?? Subsidies should consider the cost of using the alternate routes.
?? The effect of the closure on emergency transportation should be studied
?? Subsidized passenger flights should be considered

An FHWA determination to limit eligible medical mitigation activities precluded subsidizing flights

Because of the great interest in the topic during these deliberations, the ultimate configuration of the medical travel mitigation strategy evolved significantly, and continued to evolve after the selection of Preferred Options as additional information became available. Based on discussions with FHWA, especially their recommendations to limit mitigation solutions to medical travel considerations to more standard transportation solutions, the PMT determined that a fixed route medical bus, combined with some form of telemedicine service, would be more the most appropriate medical mitigation proposal.

The subsidized medical effort was ultimately limited to a medical transport bus and telemedicine

The installation of telemedicine facilities, which was not an idea documented during the Preferred Options development process, was promoted by the PMT to the Project Committee at their February 1, 2002 meeting. The technique involves the use of telecommunications and imaging technology so that specialists can examine and help diagnose or treat patients in remote areas. In describing this activity, it was understood that WSDOT involvement would be limited to investigation and promotion of the technology among potential providers, but not actual provision of the required equipment or training.

The PMT promoted the medical bus/telemedicine proposal at the February 1, 2002 meeting of the Project Committee. The project Committee concurred, and recommended that the PRTPO Executive Council approve this option as a Final Strategy.

2.2.10 Subsidized Housing

FHWA's fundamental condition about funding mitigation was that solutions should involve only normal transportation services (see previous section). Therefore, the PMT did not recommend further consideration of this option by the Project Committee. The Project Committee concurred, and did not recommend approval of this option as a Final Strategy by the PRTPO Executive Council.

The subsidized housing effort was deemed ineligible for FHWA participation and dropped from consideration

2.3 Final Strategies Selection

The PRTPO Executive Council met on February 8, 2002 to consider the recommendations of the Project Committee, and select which of the original Preferred Options would become the Final Strategies that would be implemented to mitigate the bridge closure. Besides their own working knowledge about the project, they based their selection on the recommendations of the Project Committee, and the presentation by the PMT.

The Executive Council's selection of six Final Strategies initiated Phase II of the mitigation project, which involved design and specification of the facilities and activities involved in implementing the strategies. The six Final Strategies selected by the Executive Council are:

The PRTPO Executive Council selected six Final Strategies at their February 8, 2002 meeting.

?? *Medical Transportation* - Assistance with medical needs through the development of a Transportation Medical Association (TMA) and telemedicine opportunities.
?? *Detour Improvements* - Construction along US 101 to upgrade and prepare the highway for use as an alternate route and the primary freight route during bridge closure (now referred to as Alternative Routes).
?? *Rideshare* - Work with transit agencies to create/increase rideshare opportunities.
?? *Public Information* - Public outreach and advance signing.
?? *Scheduling* - Close bridge early in the season and keep the closure brief.
?? *Ferry* - A passenger only ferry between South Point and Port Gamble verses expanded auto ferry service between Port Townsend and Kingston or Edmonds.

The work involved, and progress made, during Phase II of the mitigation plan is described in Chapter 4.

3.0 TRAVELER BEHAVIOR/TRAFFIC ANALYSIS

3.1 ORIGINS AND DESTINATIONS

Two bridge user surveys serve as the basis for traveler behavior analysis

Predicting traveler response to the closure presents a number of challenges unique to the Hood Canal Bridge East Half Replacement project. Bridge closures in the recent past, such as the one week closure of the I-5 Columbia River crossing in 1997, or the fall 2002 weekend closures of the Lewis and Clark Bridge at Longview, have involved a lesser commitment of time, and presented a more diverse range of traditional options than this closure event. Accurate predictions of behavior are the fundamental element in mitigation planning. Contracting for improvements to alternate routes, ferry boats and loading facilities, and transit connections, all depend to some extent on the ability to use reliable traffic volume predictions.

Traveler surveys were too preliminary to gauge potential reactions to many eventual mitigation options

In 1998, WSDOT engaged a consulting team led by EcoNorthwest to perform an origin and destination study (O&D study) by mail of actual identified bridge travelers. Identification relied on vehicle license plate imaging technology and matching. The purpose of the survey was to "determine trip patterns, frequency, and purpose". A more broad based follow-up survey was commissioned in 2001 to determine traveler preferences among the various mitigation options then under consideration. The target population for this follow-up survey were the O&D travelers, other interested community members, and website visitors. Key findings of the 2001 report include documentation of traveler preference for auto ferry solutions, as well as the prevalence of frequent medical travelers.

3.2 SCOPING LEVEL TRAVEL BEHAVIOR ANALYSIS

Scoping level behavior analysis relied on assumptions about traveler response based on trip purpose

In early 2002, a scoping level analysis of traveler behavior was conducted which relied on an assumed correlation between trip purpose (as identified in the 1998 O&D study) and traveler response to the project mitigation measures. This correlation was identified as a key finding of the O&D study, and provides easily identified categories useful for sorting. The analysis also assumes, in addition to the Hood Canal Passenger Only Ferry, the operation of an additional auto ferry service between Port Townsend and Kingston or Edmonds. These assumptions were later modified, in which the elimination of one or the other service from the mix was addressed.

Reliably linking traveler behavior during the closure to trip purpose has been problematic because of the nature of the two traveler surveys on which that analysis depends. Both surveys posed questions about traveler response in terms of that consistently included one or more auto ferry options. That is because the elimination of auto ferry service from the mix of mitigation options under consideration did not occur until early in 2002, long after these surveys were complete. The scoping level analysis relies on assumptions about the relationship between trip purpose and traveler response to leaving their vehicle at the dock. Its empirical approach to trip purpose/traveler response relationships represents a sound first step in determining traffic volumes for use in estimating the scope of various mitigation strategies.

Scoping level estimates indicated that over 600 passengers per hour would be served by the passenger only ferry

Results of this analysis for the South Point/Port Gamble passenger only ferry, with no other additional ferry service provided, is the most relevant given the actual Final Strategies selection. These results indicate that the four hour peak period utilization of the ferry is 2730 passengers eastbound (680 passengers/hour) and 520 passengers westbound (130 passengers/hour) during the morning peak, with 1060 additional trips (265 vehicles/hour) expected on US101 during both morning and afternoon peak periods.

To provide more potentially accurate data for use in the Phase II mitigation plan effort, another approach was devised that relies on a combination of selected survey responses and demographic information.

3.3 DESIGN LEVEL TRAVEL BEHAVIOR ANALYSIS

Design level analysis involved dividing survey participants by trip frequency and proximity to the bridge

A travel behavior analysis for use in the design phase of the project was commissioned in mid 2002 (Hood Canal Bridge Travel Behavior Analysis; see Appendix A). It focused on the impacts of the Final Mitigation strategies only. This analysis relies on survey responses to specific questions to help formulate assumptions based on trip frequency and the proximity of the traveler's origin and destinations to the bridge. Besides travel frequency and origin and destination, the key questions that are used in the analysis include:

1998 Question 11 - If you knew the bridge was closed before taking the trip, what would you have done?

2001 Question 29 - How important is the ability to take your car on the ferry in determining your choice of transportation options?

Travel behavior and traffic studies supported the Phase II mitigation planning effort

The analysis of actual trips documented in the 1998 survey proceeded with elimination of those trips that the first question revealed would be deferred. The remaining trips were analyzed using four trip categories derived from survey data indicating trip frequency and proximity of the origins and destinations to the bridge. Traveler choice was related to each trip category by assuming a distribution of traveler attitudes about the need to have a vehicle on the trip using results from the second question. The analysis was also checked to determine the independence of the results from other possible trip categories, including daytime vs. nighttime and trip purpose.

Design level analysis showed that 30% of bridge travelers would defer travel 50% use alternate routes 18% use passenger-only ferry

The results of this study indicated that approximately 32% of vehicles (6,800) are expected to defer their trip, 50% of vehicles (10,550) are expected to chose alternate routes, and 18% of vehicles (calculated to be 6,400 passengers) are expected to park and ride the Passenger Only Ferry on each weekday. The weekend results are nearly identical, with a shift of 3% away from the ferry and towards US101. Medical trips identified in the O&D Study were also measured using the same procedure, and expected trip volumes calculated. Morning peak period volumes were found to be less than half that reported in the scoping level analysis, providing greater flexibility in schedule planning.

Table 3-1 Travel Prediction

Trip Category	POF Option	POF AM Peak Period	Alternate Route Option
Weekday	6400 passengers/day	1260 pass.	10,500 vehicles/day
Weekend	6600 passengers/day	640 pass.	13,200 vehicles/day
Medical Weekday	670 passengers/day	N/A	1000 vehicles/day
Medical Weekend	240 passengers/day	N/A	340 vehicles/day

4.0 PHASE II - FINAL MITIGATION STRATEGIES

Phase II of the mitigation plan began with the selection of six Final Strategies by the PRTPO Executive Council on February 8, 2002. One strategy, concerning project scheduling, was transmitted to the design and construction team for their use in determining the closure dates, and further study was not required. The PMT met with representatives from FHWA on April 1 2002 in order to review the suggested strategies for compliance with conditions on expenditure of federal funds. The Hood Canal Bridge East Half Replacement is funded through a matching grant provided through the federal Highway Bridge Replacement and Rehabilitation Program (HBRRP). Project expenditures that are eligible for reimbursement (federal match funds) by the grant are described in the legislation (see Federal Code of Regulations Title 23 (Highways), Part 650.405. Part C). The Washington Division of FHWA is responsible for communicating to WSDOT how the statute will be interpreted. The statute is broad, but generally restrictive in its intent, with specific exclusions for items such as "long approach fills, connecting roadways, interchanges, ramps, and other extensive earth structures".

FHWA approval was required to insure that mitigation strategies did not contradict statutes

One criterion for mitigation strategy selection promoted by FHWA was the principle that only temporary facilities and services would be funded. This criterion helped the WSDOT and FHWA reach consensus on how the Medical Transportation, Rideshare, Public Information, and Ferry strategies would be implemented. However, the Alternate Routes Improvement strategy was rejected for federal matching funds because of the more permanent benefit represented by that activity.

Federal funding precluded the construction of permanent or peripheral structures for mitigation purposes

This chapter describes the components and design effort, as well as the resulting specifications for each of the five remaining Final Strategies. Besides the travel behavior study described in Chapter 3, this effort also involved the WSDOT Olympic Region's Planning Office for medical, transit, and rideshare planning, Traffic Office for alternate route and information signing planning, and Communications Office for outreach planning. Coordination between these various efforts was required within the Planning Office, where development and delivery of plans for a medical bus was required for proper planning of the transit mitigation measures, and the rideshare element of the plan was also developed and submitted to the transit committee in time for it to be incorporated in their final cost analysis. The interrelationship between these efforts is shown in Figure 4-1.

4.1 MEDICAL TRANSPORTATION

Medical travel, and the particularly sensitive nature of the issues surrounding it, has been mentioned consistently in public forums, political discussions, and technical meetings pertaining to mitigation of the bridge closure throughout the mitigation study process. Even as mitigation for medical transportation became one of the mandated mitigation measures to come out of the Advisory Committee, the full scope of the problem was only beginning to be recognized. In order to simplify the process, the problem of finding appropriate solutions was broken into two approaches to help make the task more manageable: controlling supply and demand, and designing appropriate services. These solutions were eventually isolated into two funded WSDOT initiatives: public outreach and medical bus. In the case of both of these initiatives, it was recognized that a broad cross-section of medical and transportation professionals would be required to insure that the issues would be addressed properly and sufficiently.

Medical travel mitigation by WSDOT focuses on outreach and dedicated, specialized transit bus solutions

In order to establish the needs and limits surrounding the medical traveler, the PMT commissioned a study to analyze what was known about medical travel and propose potential mitigation solutions. The Hood Canal Bridge Medical Travel Mitigation Plan (see Appendix B) identified a number of problems and potential solutions, including fixed route medical bus, telemedicine facilities, increase helicopter evacuations, increases in paramedic staff, and targeted outreach.

FHWA declined to support the use of bridge replacement funds for staff, emergency flights, and telemedicine

At their April 1, 2002 meeting, FHWA and the PMT, reviewed a draft of this material and came to an agreement about what activities would be reimbursable under federal guidelines. Their interpretation of the applicable federal code determined that mitigation activities needed to be temporary in nature, and that these activities needed to be directly related to core bridge transportation functions. Based on this criteria, they determined that only the medical bus and targeted outreach would be supported by WSDOT to mitigate medical travel issues.

Targeted outreach started soon thereafter with identification and convening of interested members of the medical community. Work sessions were convened with this group in August and November of 2002 to study the potential problems associated with the closure, and to begin to develop the concepts, requirements, organizations, and resources that might be involved in generating solutions to those problems. For convenience, these work sessions, or forums, divided into three working groups based on areas of interest: emergency transportation, non-emergency transportation, and facilities. The results of these sessions included the generation and review of fifteen narrative documents, or solution papers, which summarized each group's activities of solution development to the problems they identified. A summary of these solution papers is shown in Table 4-1. Forum participants were also asked to help develop ideas and suggestions for how, and to which destinations, the medical bus should operate.

Forums were also used to help develop meaningful input about medical bus and outreach proposals from WSDOT

One of the tangible outcomes of this initial outreach effort was related to medical transportation. At their November 13, 2002 meeting, the Northwest Region Emergency Medical Services and Trauma Care Council (NWEMS), a functional unit of the Department of Health's Office of Emergency Medical and Trauma Prevention, decided to convene a new working group to consider the impact of the bridge closure on attended (emergency and non-emergency) transports. They anticipate quarterly meetings through 2006 during which they will analyze the problems, and determine how interested providers and consumers should respond during the closure. WSDOT will participate in this effort by focusing on providing information about project plans, and documenting the group's progress.

A new working group interested in attended transport issues will convene quarterly.

Table 4-1 – Medical Providers Outreach Forums (August and November 2002) – Working Group Summaries

Solution Paper Closure Issue	Solution Summary
Access to Special Clinic – Regular Appointments	Telemedicine, temporary clinics, temporarily relocate specialists, provide outreach to doctors, and establish contact persons.
Indian Island and Jackson Hospital (US Navy) Medical Services	Military retirees pick up prescriptions here, Jackson Naval Hospital will attempt to minimize visits to Bremerton during closure
Lack of Publicly Funded Services.	Olympic Peninsula hospitals must prepare for increased ER usage.
Non-Emergency Travel	Provide dedicated fixed route, as well as on-call transport service to Seattle, Bremerton, and Poulsbo.
Port Angeles Gershowitz (Coast Guard) Medical Services	Limited services will be available to military retirees, including prescriptions.
Repetitive Services (Chemotherepy, Dialysis)	Encourage local referrals, utilize established Port Angeles and Sequim facilities for dialysis, chemotherapy, and MRI services.
Emergency Transportation Resources – Equipment and Staff	Obtain additional equipment, use different destinations to shorten detoured trips, develop temporary transport protocols for closure period.
Emergency Transportation Resources – Volunteers	Offer incentives for volunteers to use Hood Canal ferry.
Emergency Transportation Resources – Transfers across Hood Canal	Create patient pass off agreements between companies on the east and west side of Hood Canal. Develop protocol for periods when Hood Canal ferry is not running.
Emergency Transportation Services – Additional Call Volume	Hire part time temporary staff for field. Insure that staff at ferry terminals has adequate first aid training.
Emergency Transportation Services – Electric Utility Emergency Services	Develop agreement with Puget Sound Energy to insure that emergency incidents requiring their services are covered.
Emergency Transportation Services – Air Transport	Develop temporary patient transport protocols.
Emergency Transportation Services –	Develop temporary patient transport

Criteria-based Dispatching	protocols.
Emergency Transportation Services – EMS Demand	Review need for more EMS training in communities, especially in remote locations.
Emergency Transportation Services – Transport to Definitive Care (non-emergency)	Increase ambulance fleet and use of air transport. Develop reporting system to estimate congestion delays on alternate routes. Develop better incident response resources in the corridor. Change transport protocols to decrease trips.

4.2 ALTERNATE ROUTES

Since approval of this strategy by the PRTPO Executive Council, work by the PMT has focused on two categories of improvements: permanent and temporary. This separation in efforts is a result of a determination by FHWA about the funding mechanisms involved in closure mitigation work.

4.2.1 Permanent Improvements

FHWA cannot participate in the Mount Walker passing lane project.

The construction of passing lanes on both the north and south approaches to Mount Walker (between milepost 298 and 300) has been a priority of participants throughout the mitigation planning process. Despite the high level of interest, FHWA has determined that permanent improvements to the US 101 facility, like passing lanes, could not be funded with federal participation. Alternative sources of funding are being sought at the time of this writing.

Other permanent improvement projects in the WSDOT current Capital Improvement and Preservation Program (CIPP) could provide significant benefits in minimizing the impacts of the Hood Canal Bridge closure if funding were available. Table 4-2 depicts projects currently in the CIPP and the biennium that construction is expected to be funded.

4.2.2 Temporary Improvements

Olympic Region Traffic Office conducted traffic analysis of likely alternate routes.

In 2002, the PMT initiated an effort by the Olympic Region Traffic Office to 1) identify state highway locations that would experience the most critical traffic impacts during the bridge closure, and 2) determine the most expedient temporary measures to mitigate those impacts.

Preliminary Results of the Traffic Impact Analysis

The Traffic Office analysis involved an examination of the most likely alternate routes, including:

- SR 104 - US 101 - SR 106 - SR 3 – SR 104
- SR 104 - US 101 - SR 106 - SR 3 – SR 305 – SR 307 – SR 104
- SR 104 - US 101 – I-5
- SR 104 - US 101 - SR 106 - SR 3 – SR 302 –SR 16. (This alternative route would have the least usage as compared to other alternative routes.)

Table 4-2 Capital Improvement and Preservation Projects

Safety and Mobility Improvement Projects Locations	Biennium	Preservation Projects Locations	Biennium
SR 3/Allyn to SR 106 Vicinity – Safety	07-09	SR 3 Imperial Way to Sunny Slope - Paving	03-05
SR 3 Imperial Way to Sunny Slope - Channelization Improvements	03-05	SR 3 Thompson Rd to SR 104 - Paving	03-05
SR 3/SR 106 Intersection - Signal and Channelization Improvements	Unfunded	US 101/US 104 to Quilcene River - Paving	05-07
SR 305 Poulsbo City Limits to Bond Road	Construction Unfunded	US 101/Leland Creek Flooding Stage 3	03-05
SR 3/SR 303 I/C (Waaga Way) – New Ramp and Channelization Improvements*	03-05	US 101/Mt Walker to Brinnon Lane - Paving	03-05
US 101/Blyn Vicinity – Passing Lanes*	07-09	US 101/SR 106 to SR 108 - Paving	03-05
US 101/Gardinier Vicinity – Truck Lanes*	09-11	US 101/ Delphi Rd Undercrossing - Seismic	03-05
SR 104/SR 19 Intersection - Safety	05-07		
SR 104/Miller Rd - Safety	05-07		

*"Nickel Funding " Package Projects

Twenty-four critical locations along the likely alternate routes were examined

A preliminary examination of these routes indicated that only two-lane segments, and particular major intersections connecting those segments, would be the most critical locations. Twenty-four specific locations were identified for further study (See Figure 4-2).

Assumptions and Methods

Most study locations were subjected to multi-day, weekday 24-hour traffic counts. Where they were available, recent traffic counts were used in the remaining locations. Some locations were also selected for weekend peak period counting.

Based on generalized results of Travel Behavior Study conducted in 2002 (see Chapter 3), it was assumed that 50% of the normally anticipated bridge traffic would use the alternate routes identified in the preliminary results (see above). All traffic volumes were inflated by 4% per year from year of measurement to 2006 based on historical count results reported in the O&D Study and

elsewhere. The O&D study was also used to help determine traffic splits among the three alternate routes identified for study.

Traffic conditions were examined using transportation industry-standard methods and software

Industry-standard methods and software (Synchro 4.0 and HCS2000) were used to analyze the closure traffic conditions. The methods and software were used to measure the effectiveness of particular temporary measures that might be installed along the identified routes. To accomplish this, a measure of effectiveness based on the Level of Service (LOS) concept was used. This concept provides for different measurement techniques based on the type of facility under consideration. Table 4-3 shows the relationship between vehicle density and LOS measurement used to assess the highway segments on the routes. Table 4-4 shows the LOS measurement relationship used to determine the effectiveness of improvements at intersections. The intersection measurement is based on seconds of delay encountered by vehicles. Both LOS measurement techniques use a scale ranging between A and F, where A is free-flowing traffic, and F is a forced-flow, highly congested condition, where the facility is experiencing reduced traffic capacity.

Table 4-3 – LOS for Highway Segments Based on Traffic Density (from TRB Highway Capacity Manual, pg 23-3).

LOS	Density Range (vehicles/mile/lane)
A	0-11
B	12-18
C	19-26
D	27-35
E	36-45
F	>45

Table 4-4 – LOS for Intersections Based on Vehicle Delay (from TRB Highway Capacity Manual, Exhibit 16-2 and 17-2).

LOS	Control Delay per Vehicle -Signalized (sec/veh)	Control Delay per Vehicle -Unsignalized (secs/veh)
A	<11	<11
B	11-20	11-15
C	21-35	16-25
D	36-55	26-35
E	56-80	36-50

F	>80	>50

Mitigation Criteria & Potential Solutions:

LOS E or better on alternate routes and LOS D or better at Hood Canal park & ride/ferry facilities were identified as analysis mitigation objectives

The mitigation objective was determined to maintain LOS E or better at intersections along highway segments on the identified alternate routes. Because of their critical impact on the success of closure mitigation, a measurement of LOS D or better was selected for intersections serving Park & Ride facilities at the Hood Canal passenger-only ferry terminals. Finally, for certain locations already operating at LOS E or F, it was determined that proposed temporary solutions would not be required to meet an LOS standard, but would only have to demonstrate some improvement in performance.

The following mitigation efforts were assumed to be in place prior to considering any route improvements:

- ?? Temporary signing and/or Variable Message Sign (VMS)
- ?? Highway Advisory Radio (HAR)
- ?? Incident Management Plan includes IRT, Coordinated EMS, Alternate Routes (forest service roads)
- ?? Temporary Channelization Improvements
- ?? Temporary Signalization

Three of the intersections studied would operate at LOS E or below in 2006 without the bridge closure

Traffic analysis indicates that most of the study intersections would operate at a level of LOS D or better in year 2006 without the Hood Canal Bridge closure, except for the following intersections, which would operate at a level of LOS E or below:

- ?? SR 305 / SR 307 (Bond Rd)
- ?? SR 3 / Sam Christopherson (SR 3 Spur)
- ?? SR 3 / SR 106

The analysis also indicates that most of the study intersections would operate at a level of LOS D or better in year 2006 with the Hood Canal Bridge closure, except for the following intersections, which are expected to operate at a level of LOS E or below:

Five of the intersections studied would operate at LOS E or below in 2006 with the bridge closure

- ?? SR 305 / SR 307 (Bond Rd) Intersection,
- ?? SR 3 / Sam Christopherson Ave Intersection,
- ?? SR 3 / SR 106 Intersection.
- ?? US 101 / SR 119 (Lake Cushman Rd)
- ?? US 101/ SR 106

The Olympic Region plans to take additional weekday PM traffic counts before and during the Labor Holiday in 2004 for the selected locations to validate the traffic demands with and without the Hood Canal Bridge closure. The traffic impacts and the preliminary mitigation measures will be re-evaluated.

During 2004 additional traffic counts will be performed and preliminary measures reevaluated

Table 4-5 identifies the traffic analysis results at the 24 selected locations and proposed mitigation strategies where deemed appropriate. The following mitigation recommendations are proposed for the following critical locations.

SR 104 / Pacific Ave: Provide a right-turn pocket or taper westbound to northbound with standard right turn corner design (see WSDOT Design Manual (DM) Figure 910-13, and Figure 910-8 respectively). If the inbound and outbound traffic of the park-n-ride (for POF) during the bridge closure are higher then anticipated in the analysis, then the recommendation is to implement an All-Way Stop Control at this intersection with simple signing change.

SR 3 / Sam Christopher Road: Extend the existing truck climbing lane on the SR 3 north bound (on south side of the intersection) about 900 ft to the north, back to this intersection. Revise the lane configuration of the northbound traffic at south approach to reflect an exclusive left-turn lane, two through-lanes with the outside lane to be a shared through-right lane. If the existing geometric conditions would allow a feasible option to install a right turn taper without interfering with the existing signal pole or other constraints, it is strongly recommended to accommodate this right turn taper for improving the intersection signal operation.

With the recommended improvements above, the intersection would still operate at a level of LOS F but with a much better condition than the "Do Nothing" alternative. With these recommended improvements, it is anticipated during the closure the intersection would operate at a level of service somewhat close to the pre-condition of level of service before closure.

In order to maintain the intersection to operate above a level of LOS E or better, all of the improvements above and additional improvements would be needed on the SR 3 southbound, north approach. The additional improvements would require two through lanes approaching and leaving the intersection. This requires intensive modifications to the existing intersection and is not a feasible option due the constraints on the north approach. These constraints include the insufficient distance for lane merging (from 2 lanes to a single lane) before approaching the on-ramp split area and the potential structure widening associated with the proposed two receiving through lanes. Therefore, the additional improvement on the south bound is not recommended based on the reasons mentioned above and especially the temporary condition of the closure.

SR 104 / Shine Pit Access (South Point POF-P&R Access): Provide a standard right turn corner design, eastbound to southbound onto the Shine Pit Access (see WSDOT DM Figure 910-8).

US 101 / SR 119 (Lake Cushman Road): Provide a right-turn lane eastbound to southbound, a left turn lane of 150 ft northbound to westbound. Refer to the DM Figure 910-14 for the right-turn lane design and the Figure 910-11a for the left-turn lane design. Since this area has narrow roadway width and bridge constraints at the north approach, recommend modifying the intersection with best-fit channelization that reflects the recommendations listed above and meets the minimum requirements as a temporary condition.

With these recommended mitigation measures, the mainline (US 101) would operate at a level of LOS D. All traffic movements at this intersection would operate at a level of LOS D or better except for the left-turn movement on the side street, which would operate better than the condition without the improvements but still at a level of LOS F. However, this left-turn volume is low volume (49 vph during weekday PM Peak). It is expected that during the closure the Lake Cushman Road would operate at a failing level of service but not to far off from the pre-condition level of service before closure.

In this vicinity, there is no feasible alternative route for the left-turn movement on the Lake Cushman Road to use in order to minimize the delays for this movement. If during the Hood Canal Bridge closure the delays to this movement are more significant, than anticipated, the recommendation would be to provide a manual traffic control to stop mainline traffic allowing the traffic on Lake Cushman Road to make left-turn onto the US 101 northbound during peak hours.

A temporary signal is not being recommended at this location since the recommended channelization improvements adequately addresses the traffic impacts and having a signal would create adverse effects to the operation of mainline traffic.

Incident Management Plan (IMP)

An Incident Management Plan will be developed in conjunction with EMS agencies before closure

In addition to evaluating traffic and developing traffic improvement options, the Olympic Region Traffic Office has assigned a team to perform the on-going task of developing an effective Incident Management Plan (IMP). This effort will be continuous from now until the construction of the proposed project. It will include EMS coordination with EMS and law enforcement agencies. The IMP will address such items as the use of Incident Response Teams (IRT) and identification of, possible emergency alternative routes, such as using forest service roads.

4.3 PUBLIC INFORMATION

4.3.1 Public Outreach

This strategy incorporated two efforts identified in the original preferred options list: public outreach and informational signing. The Olympic Region Communications Office performed an initial review of the parameters of a public outreach effort during the summer of 2002. At that time, a request for proposal (RFP) was developed that described the objectives of this work and the associated competitive consultant selection process. The RFP specified five core competencies that would be required of the successful firm:

A public outreach consultant was selected based on five demonstrated core competencies

?? *Strategic Planning for Communications* – This element refers to a demonstrated expertise in marketing to target audiences, and developing market research, public relations, public affairs, public education, product branding, media relations, issues analysis, management and public involvement strategies, and intergovernmental relationships.

?? *Market Research and Analysis* – This element refers to a demonstrated expertise in analyzing and using market research results related to the interests and concerns of the interested communities.

?? *Creative Concepts, Design, and Content* – This element refers to a demonstrated expertise in developing and producing compelling messages intended to reach a varied target audience.

?? *Distribution and Media* – This element refers to a demonstrated expertise in developing and distributing communications products for target audiences.

?? *Product Development and Production* – This element refers to a demonstrated expertise in developing and producing communications products for different and specified mediums.

Public outreach activities will be based on a grassroots strategy

The Demich Group, of Olympia, WA, has been selected to provide outreach services by WSDOT. Their work will focus on the development and deployment of targeted outreach materials for commuters, tourists, and medical travelers. Distribution of these materials, and the information they contain, will depend primarily on a networking effort with interested citizens and community groups. The fundamental strategies for developing public awareness about the closure rely on a grassroots approach that recognizes the project's budgetary restrictions and rural media market characteristics. Ideas currently being considered along these lines include the development of point of sale kits for use by local retailers, and presentation materials for use by local community groups. The medical community, both consumers and providers, will also be targeted in these efforts.

The extent of the closure impact precludes the identification of specific detour routes

4.3.2 Advance Signing

The PMT began corresponding with the Olympic Region Traffic Office late in 2001 to begin the process of designing work zone traffic control and advance signing efforts. Early in 2002 they were engaged in the effort to design signing requirements for the temporary ferry terminals and park and ride facilities at South Point and Port Gamble. Advance signing plans

are included in the construction bid set, and are based on requirements that focus on the need to sufficiently modify existing and provide for new signs that will properly inform and direct travelers.

The messages and locations for Variable message signing (VMS), and highway advisory radio (HAR), are also included in the plan. Information on advance signs includes basic closure message, HAR area notice, traveler information telephone number, and dates and times where it is appropriate. The public outreach program will deploy informational brochures at affected ferry terminals. Although it was considered, specific detour routes will not be indicated; OR Traffic staff determined that there are too many independent and diverse destinations that would have to be covered. In addition, its doubtful that driving conditions on any of the alternate routes will be predictable, so the decision to use one or the other is better left to the travelers own discretion. Information about the location and access to the ferry terminals at South Point and Port Gamble will posted in those vicinities.

WSDOT will coordinate with local agency partners to insure sign modifications take place on all routes

Plans have been developed to provide traveler information and traffic control for:

?? Work zone issues for widening the west half structure
?? Two full weekend closures
?? One full eight week closure

See Table 4-6 and Table 4-7 for details about the sign locations (by milepost) and messages associated with the eight-week closure. Figure 4-3 shows the expected sign locations superimposed on a map of the region.

Local agencies will be contacted and advised by the OR Traffic Office prior to closure to help them plan any modifications to their own sign installations. WSDOT sign crews and local agency counterparts will be notified and employed during the closures to install advance signing. They will also review the existing sign inventory, cover or modify them, and monitor the situation during the closure. The Olympic Region Traffic Office will be consulting with the construction engineer and others during the closure to review any unforeseen problems or conditions, and to insure that necessary changes in the advance-signing program are made.

Table 4-6 – Advanced Signing Message Codes and Text

Sign Type	Message
SP-3A	Hood Canal Bridge Advisory/Bridge Closure Information 1-800-xxx-xxxx
SP-3	Hood Canal Bridge Advisory/Bridge Closure Information Tune 530 AM
SP-4 (west half widening project)	Oversize Load Restriction/No Loads Over 10 ft Wide Allowed
Permanent VMS/Weekend	Hood Canal Bridge Closed This Weekend (2

Closure	sec)/Friday xx:xx PM to Monday xx:xx AM (2 sec)
Permanent VMS/Eight Week Closure	Hood Canal Bridge Closed Until xx/xx/2006 (2 sec)/Bridge Closure Information 1-800-xxx-xxxx
Portable VMS/Weekend Closure	Hood Canal Bridge Closed/This Weekend

Table 4-7 – Advanced Signing Locations

Sign Type	**Location**
SP-3A	Ferry Terminals – Kingston, Port Angeles, Port Townsend, Keystone, Edmonds, Bremerton, Bainbridge Island, Seattle
SP-3A	NB SR101 at EB SR106
SP-3A	EB SR104 at NB SR19
SP-3A	WB SR20 at SB SR19
SP-3A	SR16 at MP 0.75 (Tacoma vicinity)
SP-3	SB SR101 at EB SR20
SP-3	NB SR5 at MP 103.2 (directly south of SR101)
SP-3	East and west approaches to Hood Canal Bridge (HCB)
SP-4 (west half widening project)	NB SR3 at MP 59.5 (directly south of SR104 and HCB)
SP-4 (west half widening project)	WB SR104 at MP 16.1 (directly west of Port Gamble)
SP-4 (west half widening project)	EB SR104 at MP 13.3 (directly west of HCB)
Permanent VMS	SB SR101 MP 283.3 (directly north of SR104)
Permanent VMS	NB SR3 at MP 50.7 (Poulsbo vicinity)
Permanent VMS	NB SR305 at MP 12.3 (Poulsbo vicinity)
Permanent VMS	WB SR16 at MP 4.0 (Tacoma vicinity)
Portable VMS	NB SR5 at MP 103.3 (directly south of SR101)
Portable VMS Portable VMS	SB SR5 at MP 105.6 (directly north of SR101)
Portable VMS	NB SR16 at MP 28.9 (Gorst vicinity)

4.4 RIDESHARE

The Rideshare element of the mitigation plan focuses on connecting east Jefferson, Clallam, and Kitsap County travelers assistance services, commuter information, and registration for rideshare opportunities prior to and during the closure. This will provide Olympic Peninsula travelers desiring to use alternatives such as transit, carpooling or vanpooling to destinations in Kitsap County and the greater Seattle urban area with the help needed to arrange such a change. Details about the design process and ultimate configuration of this program are described below.

A 'shelf-ready' rideshare plan was develop to link travelers to rideshare opportunities

A rideshare interest group, consisting of a subset of the Hood Canal Bridge Mitigation Transit Committee, including Kitsap Transit, Jefferson Transit and WSDOT, convened to develop a 'shelf ready' rideshare program for assisting travelers with information about all of the available transit options (carpools, passenger-only ferry, vanpools, etc.) during the closure.

In their deliberations, this group discussed the availability of current rideshare services, program requirements, estimated implementation costs, implementation schedule, and potential outreach strategies. The group investigated the possibility of adapting the Hood Canal Bridge closure requirements into Kitsap Transit's existing rideshare system. Kitsap Transit is currently a participant in the region's ride match service, and currently supports a vanpool program.

The rideshare plan is tailored to adapt to the existing Kitsap Transit program

The proposed system was configured to operate within Kitsap Transit's existing rideshare program east of Hood Canal. Implementing the program west of Hood Canal will require Jefferson Transit to establish and staff a call center and coordinate the establishment of new vanpools as needed.

4.4.1 Rideshare Plan Components

The rideshare group eventually developed a temporary rideshare system that utilizes connections to the existing Puget Sound Rideshare database system for purposes of ride matching. The proposed rideshare system involves four fundamental elements:

Rideshare registration can be accomplished through the internet or 800-phone number

Twenty-four hour internet on-line rideshare registration program - The existing program is located on the Internet at www.rideshareonline.com. Users may employ an online database to identify their transportation needs and be matched up with others with similar needs for the purpose of sharing rides. In such cases where personal contact is indicated, King County Metro employees may contact users to put them in touch with the appropriate transit system to serve their needs, such as establishing a vanpool.

Temporary ride-match call center - For those who do not use computers, a ride-match call center is imperative to the rideshare plan. The call center should be reachable by means of an 800 number to remove the barrier of long distance calling. It may be possible for Jefferson Transit to implement a call center for the mitigation project with minimal expense other than staffing, particularly if it is attached to one already existing, such as Kitsap Transit.

Limited trip planning assistance - Trip planning assistance could be included in the scope of the call center position above. Trip planning assistance would also support the transit component of the mitigation plan by helping people to find out how they can use all public transportation modes available to reach their destinations.

Establishment of Vanpool Groups - The most efficient method of ridesharing would be grouping people by destination and arrival time. A rideshare service would first establish the need for specific vanpool groups. Once a vanpool group has been identified, one or more representatives will need to establish contact with an administering agency (Jefferson Transit or Kitsap Transit) that will administer a defensive driving course and provide instruction on the use of the vanpool vehicle. Existing and NewVanpool groups established as part of the mitigation plan would not be compensated by the plan. Vanpool user rates established by the transit agencies will apply to commuters using public agency vanpools.

Transit agencies will administer vanpools and user rates will apply

Up to ten vans could be made available by Kitsap Transit at regular rates to any group that wanted to start a vanpool at the Port Gamble Park & Ride lot. Kitsap Transit currently operates a worker/driver route that goes through Port Gamble bound for Puget Sound Naval Shipyard. This route would be configured to meet an early ferry arrival at Port Gamble. The same bus would also be expected to meet one of the evening trips departing from Port Gamble. The current worker-driver bus program, which supports the Bangor Naval Base and Puget Sound Naval Shipyard, would be expanded as demand dictates.

4.4.2 Rideshare Outreach

Signs, brochures, telephone hotlines, and the Internet will be used to support rideshare

A public outreach element of the rideshare program was identified as crucial to the success of the program. The majority of this promotional effort will need to occur long before the closure date. Outreach strategies now under consideration include static rideshare promotional signing along the highway, informational posters or rider alerts, and brochures. Proposed brochure display areas include public places on the Peninsula, in ferry terminals, as well as on the ferries themselves. Telephone information strategies include the use of the new 511 transportation hotline and the potential establishment of a toll free information line.

A rideshare web site is also proposed, and involves participating transit agencies contributions. A web-based “rider alert” program, and an email distribution list similar to that used by WSF, is also proposed for providing immediate notification of service changes. Based on discussions held with Kitsap Transit, its possible that configuration and deployment of this Internet component of the rideshare outreach strategy could be incorporated into their existing Internet program by June 2005.

Ferryboats will have a capacity of about 150 passengers per trip

4.5 PASSENGER TRANSPORTATION/TRANSFERS

4.5.1 Ferries

A passenger only ferry service is proposed to connect terminals at South Point and Port Gamble. Figure 4-4 shows the conceptual layout for the service and supporting facilities. An initial review of this service by the PMT indicated that the required boats would have a capacity of approximately 150 passengers, and that they needed to be capable of making the

one way crossing in no more than 20 minutes. In addition, qualifying boats would need to be capable of docking at the limited facilities available at the proposed terminals, and they must be accessible to passengers in accordance with provisions of the Americans with Disabilities (ADA) Act.

Twenty-minute departure intervals are anticipated during peak periods

A regular schedule of ferry departures is anticipated (see Table 4-7 for a conceptual departure plan). In general, it's expected that twenty minute departure intervals would only be necessary during the morning and afternoon peak travel periods, with thirty minute intervals during mid-day, and sixty minute intervals in the evening expected to be sufficient. A total of three boats are expected to be in service, with a fourth available as a backup. The ferry departure times shown in the conceptual plan are based on the first departures at Kingston and Bainbridge, with subsequent runs timed according to expected capacity needs only. Transit departures from Port Gamble for WSF terminals at Kingston or Bainbridge will be timed to meet scheduled WSF arrivals. Therefore, any dockside passenger queuing is expected to take place in Port Gamble.

4.5.2 Terminals and Parking

Terminal locations and facility requirements were established by the PMT and approved by the PRTPO Executive Council. Improvements associated with the terminal facilities were studied, designed, and specified for bidding by both WSDOT during the Summer and Fall of 2002. This work was reviewed and the plans incorporated into the contract bid documents. Park & ride operations will require parking for up to 1500 vehicles (about 12 acres), with associated traffic, multimodal, environmental, and security improvements.

South Point parking will be at a remote location, but parking at the Port Gamble terminal will be adjacent to the dock

Because of limited, reasonable alternatives immediately adjacent to the terminal, the South Point operation will require siting of a remote parking lot at the Shine gravel pit operation. The Port Gamble terminal has sufficient space at the terminal for the required 1500 stalls. Neither parking operation will involve asphalt paving since this type of improvement has been interpreted as non-temporary, and therefore ineligible for Highway Bridge Replacement and Rehabilitation Program funds. The exception to this is any areas that require paving in order to conform to requirements associated with the Americans with Disabilities Act.

Jefferson and Kitsap Transit will manage security and other

At both terminals, traffic/multimodal improvements include a paved transit island and shelter/portable toilets, curbing, and signing. Environmental improvements include the stormwater conveyance and treatment facilities required to mitigate impacts caused by increases in impervious area. Security provisions will include gates, fencing, illumination, and trained patrol personnel. Operation and maintenance of the park and ride facilities, such as security, toilets, trash removal, and coordination with the ferry terminal operation, will be performed by Jefferson Transit (Shine gravel pit) and Kitsap Transit (Port Gamble).

Communications between the transit agency operating the park-n-ride and the port agent of the passenger-only ferry operations has been identified as a key component. Good communication will be required to insure that the transit and passenger-only ferry service is a seamless operation.

Table 4-7 – Conceptual Hood Canal Passenger-only Ferry Times
(parentheses indicate boat identifier)

South Point Depart	Port Gamble Arrive	Port Gamble Depart	South Point Arrive
0300 (1)	0320 (1)	0330 (1)	0340 (1)
0400 (1)	0420 (1)	0430 (1)	0450 (1)
0500 (1)	0520 (1)	0530 (1)	0550 (1)
0520 (2)	0540 (2)	0550 (2)	0610 (2)
0540 (3)	0600 (3)	0610 (3)	0630 (3)
0600 (1)	0620 (1)	0630 (1)	0650 (1)
0620 (2)	0640 (2)	0650 (2)	0710 (2)
0640 (3)	0700 (3)	0710 (3)	0730 (3)
0700 (1)	0720 (1)	0730 (1)	0750 (1)
0720 (2)	0740 (2)	0750 (2)	0810 (2)
0740 (3)	0800 (3)	0810 (3)	0830 (3)
0800 (1)	0820 (1)	0830 (1)	0850 (1)
0820 (2)	0840 (2)	0850 (2)	0910 (2)
0840 (3)	0900 (3)	0910 (3)	0930 (3)
0900 (1)	0920 (1)	0930 (1)	0950 (1)
0920 (2)	0940 (2)	0950 (2)	1010 (2)
0940 (3)	1000 (3)	1010 (3)	1030 (3)
1000 (1)	1020 (1)	1030 (1)	1050 (1)
1020 (2)	1040 (2)	1050 (2)	1110 (2)
1040 (3)	1100 (3)	1110 (3)	1130 (3)
1100 (1)	1120 (1)	1130 (1)	1150 (1)
1120 (2)	1140 (2)	1150 (2)	1210 (2)
1140 (3)	1200 (3)	1210 (3)	1230 (3)
1200 (1)	1220 (1)	1230 (1)	1250 (1)
1220 (2)	1240 (2)	1250 (2)	1310 (2)
1240 (3)	1300 (3)	1310 (3)	1330 (3)
1300 (1)	1320 (1)	1330 (1)	1350 (1)
1320 (2)	1340 (2)	1350 (2)	1410 (2)
1340 (3)	1400 (3)	1410 (3)	1430 (3)
1400 (1)	1420 (1)	1430 (1)	1450 (1)
1420 (2)	1420 (2)	1450 (2)	1510 (2)
1440 (3)	1500 (3)	1510 (3)	1530 (3)
1500 (1)	1520 (1)	1530 (1)	1550 (1)
1520 (2)	1540 (2)	1550 (2)	1610 (2)
1540 (3)	1600 (3)	1610 (3)	1630 (3)
1600 (1)	1620 (1)	1630 (1)	1650 (1)
1620 (2)	1640 (2)	1650 (2)	1710 (2)
1640 (3)	1700 (3)	1710 (3)	1730 (3)
1700 (1)	1720 (1)	1730 (1)	1750 (1)
1720 (2)	1740 (2)	1750 (2)	1810 (2)

1740 (3)	1800 (3)	1810 (3)	1830 (3)
1820 (2)	1840 (2)	1850 (2)	1910 (2)
1850 (3)	1910 (3)	1920 (3)	1940 (3)
1920 (2)	1940 (2)	1950 (2)	2010 (2)
1950 (3)	2010 (3)	2020 (3)	2040 (3)
2050 (3)	2110 (3)	2120 (3)	2140 (3)
2200 (3)	2220 (3)	2230 (3)	2250 (3)

4.5.3 Transit

A committee consisting of transit agencies, representatives from the Peninsula RTPO, WSDOT, and local jurisdictions met on July 24, 2002. The purpose of the committee was to develop a group of transit mitigation strategies that provide a balanced approach to support the South Point to Port Gamble passenger-only ferry and respond to the temporary impacts resulting from the construction related closure of the Hood Canal Bridge. During the meeting, it was recommended that the transit agency managers meet with WSDOT separately to discuss technical requirements and issues and directly assist in the development of a public transit connection system to be implemented during the bridge closure.

The transit agencies (Clallam Transit, Jefferson Transit, and Kitsap Transit) first met on August 23, 2002 to consider the expected passenger service volumes and determine a course of action for compiling the transit component. The agencies were requested to develop a transit component that would support WSDOT's proposed South Point to Port Gamble passenger-only ferry service and park and ride facilities as well as support the medical mitigation recommendations proposed by the Medical Mitigation forums. WSDOT and transit agencies subsequently met three more times and presented their final proposal to the Transit Committee on February 13, 2003.

The transit agency service proposals augment current service

During discussions with the transit agencies it was agreed that the proposed transit support to the ferry service would be an augmentation to current transit services, and that the regional transit agencies would continue to meet the on-going needs of their county residents throughout the length of construction. The services proposed by the transit agencies are in direct response to parameters proposed by WSDOT. These parameters center on the establishment of a walk-on passenger ferry and recognizes the passenger-only ferry as an integral portion of any transit connection system that is provided. The parameters or assumptions include:

Only transit vehicles will be able to access the South Point Terminal

?? Primary focus of the transit mitigation efforts will on weekday commuter trips. That weekend ferry and transit service could be modified to reflect the different weekend travel peak periods.

?? That two 1,500 vehicle park and ride lots will be developed and operated on each side of the Hood Canal (currently, Shine Pit on the west side and Port Gamble on the eastside).

?? South Point ferry facilities will be limited to transit only and any express service will operate straight to and from the South Point facilities. Vanpool and carpool vehicles will utilize the Shine Pit park and ride lots and will not be allowed at South Point.

?? The passenger-only ferry service will have a maximum capacity of 150 passengers per vessel with a maximum of three vessels per hour yielding a maximum delivery of 450 passengers per hour in each direction during peak periods.

?? The passenger-only ferry schedule would be based on Washington State Ferry (WSF) ferry sailing times. South Point/Port Gamble passenger-only ferry departures and arrivals would be scheduled to coincide with the departures and arrivals of ferries at Kingston, Bainbridge Island and Bremerton.

Buses serving the terminals will be "fare free"

?? Express and shuttle bus services will be 'fare free' to users.

?? Passenger-only ferry and transit service would commence one week prior to the closure of the Hood Canal Bridge (May 1, 2006).

?? Fixed transit express supported medical transportation services would be offered during weekdays only. This would not replace the current dial-a-ride paratransit service.

?? That some sort of a support agreement would have to be agreed upon with the participating transit agencies prior to the Hood Canal Bridge project going to bid (originally estimated to be December 2002). (During the process it was determined that this requirement was not necessary and was dropped, though a local agreement with each of the transit agencies will be required prior to commencement of services.)

A conceptual ferry schedule was used to develop expected passenger

A conceptual passenger-only ferry schedule was used for purposes of developing the proposed transit services plan. This schedule, shown in Table 4-6, was based on anticipated passenger usage that was formulated using the data collected from the Hood Canal Bridge Origin and Destination (O&D) survey as well as the departure arrival times of WSF ferries on the Kitsap Peninsula. The Travel Behavior Study (See Chapter 3) indicated that approximately 20% of the bridge users would use the passenger-only ferry. In order to ensure that enough capacity was built into the ferry service, for planning purposes the schedule was developed using a 30% usage rate.

Transit Service Strategies

An initial proposal to meet each ferry was reduced to account for anticipated

An initial conceptual transit support plan developed by the transit agencies provided for bus service to meet each passenger-only ferry arrival and departure at their respective ferry dock. Upon review, the plan was modified to take in account that while the maximum capacity must be accounted for it is unlikely that the maximum demand would be placed on the system throughout the length of the service day. It is anticipated that reflected a gradual build-up and subsequent reduction of services, as the day progresses would occur. During the peak AM and PM periods, it is anticipated that a full complement of vessels (3) would be operating daily.

Consideration was also given for a shorten passenger-only ferry operational period where ferries would not be running during a full twenty-four hour period as well as a planning budget level of $2.4 million. A separate proposal from each of the three participating transit agencies forms the basis for transit service strategies. Each proposal is described below. Figure 4-5 shows the routes that are described in each proposals.

Clallam transit will provide peak hour express service between

Clallam Transit - Clallam Transit would provide daily express transit service from Port Angeles/Sequim area to the South Point Ferry Dock for the eight-week closure period in mid-2006. It is anticipated that daily express service would run during the peak hours of the day. Three express runs would be made during morning peak period, departure times would coincide with the South Point ferry departure times. Three express service runs in the afternoon would also operate during the evening peak periods. No other new service is anticipated, Clallam Transit would rely on existing transit service. Clallam Transit current has three daily connections with Jefferson Transit that could be utilized during the off peak periods.

Jefferson Transit - Jefferson Transit agreed to operate a shuttle service between Westside park-and-ride facility and the South Point ferry dock. The shuttle Service proposed by Jefferson Transit is modeled on a moderate demand model. That is to say, the plan assumes that most of the demand on the system will be below maximum capacity; however, it does allow for easy response to a maximum demand contingency as the need arises. The rationale is to balance allocation of resources against service requirements.

South Point/Shine Pit shuttles will be timed according to

The proposed shuttle would operate regularly between the parking-n-ride lot and the South Point ferry dock to coincide with the arrival and departure of each passenger-only ferry. The general configuration calls for the arrival of two transit coaches at the ferry dock: one at ten minutes prior to departure and the second at five minutes prior to departure. These vehicles are also timed to accommodate an arriving ferry allowing two transit vehicles to meet each boat. The level of service provided by the shuttle would parallel that of the ferry, starting out modestly and building throughout the day, finally reducing itself as the schedule wind's down.

Five transit coaches will be required for the South Point/Shine

In order to meet the demands of those individuals requiring American with Disability Act (ADA) accessibility, a specific vehicle will be assigned to operate during the peak service hours to handle all wheelchair and other accessibility issues. This vehicle would have a minimum of two wheelchair locations and would operate on-call between the parking-n-ride lot and the ferry dock as necessary. The successful use of this vehicle will require

accurate and timely communication between both facilities and the arriving ferry. Based on the service detailed above, the actual shuttle operation requires the following: Five (5) transit coaches in service during the peak period, one (1) wheelchair dedicated transit coach in service during the peak period, and one stand-by coach in service during the peak period.

In addition, Jefferson Transit plans to provide direct service between ferry dock and Port Townsend/Port Hadlock/Port Ludlow. Currently, Jefferson Transit operates four weekday roundtrips between Port Townsend and Poulsbo, and two Saturday/Sunday roundtrips. This service represents the only existing public transit linkage across the Hood Canal Bridge. Ridership is steady and the route delivers approximately 80 weekday trips and 35 weekend trips.

Jefferson Transit will operate their existing Port

In order to maintain this service as close to normal as possible, that is to provide direct linkage between Port Townsend and the east side of the Hood Canal, the service will remain with a few key adjustments. In order to provide the best level of service, the route will operate directly into the South Point ferry dock site, bypassing the parking lot. In addition, since the segment across the Hood Canal will not operate, approximately one hour per each round trip will be saved. This savings would be reinvested into the mitigation service by operating additional express service between Port Hadlock/Port Ludlow during peak commute hours.

Kitsap Transit - Kitsap Transit is not making the same assumption as Jefferson Transit, that it would need to have enough bus capacity at each ferry arrival/departure to handle a full ferry load of 150 passengers. Instead, Kitsap Transit would have buses meet the ferry arrivals in Port Gamble and provide express service routes to the WSF terminals in Kingston and Bainbridge Island only when there are ferries to meet at those ferry terminals.

Kitsap Transit will operate Port Gamble service to meet each WSF departure at Kingston and Bainbridge

Three direct express bus routes would service the Kitsap Peninsula, one express route would directly go to Kingston Ferry Terminal; another would directly go to the Bainbridge Island Ferry Terminal via a stop in Poulsbo. No direct express service would be provided to the Bremerton WSF Ferry Terminal, it is expected that connection to the Bremerton terminal could be made through regular bus service.

The third bus route will go directly to Silverdale to the Kitsap Transit Transfer Center at the Kitsap Mall, where connections can be made to other buses that continue on to Bremerton and locations in-between. The Silverdale express service is proposed to meet each ferry during regular service hours only (9:30 am to about 7:00 pm). There would be no service to Kingston or Bainbridge on the weekends. During peak periods, an additional bus could be on "stand-by" in case one of the scheduled buses cannot accommodate all the passengers bound for a particular destination.

Non-emergency Medical Transit Service Proposal

A need to provide dedicated fixed route, as well as on-call transport service to Seattle, Bremerton, and Poulsbo during the closure was identified during the Medical Provider

forums (section 4.1 Medical Transportation). This fixed route medical bus would transport non-emergency patients to identified medical destinations from the Port Gamble park and ride/ferry terminal. Figure 4-6 shows the proposed routes involved in the proposal. It is anticipated that Olympic Peninsula residents seeking medical care in the central Puget Sound area would use their own vehicle, paratransit or existing transit to travel to South Point.

Kitsap Transit will operate a specialized medical bus to Bremerton, and Silverdale

Since the medical destinations were identified as being in the central Puget Sound area, Kitsap Transit was asked to develop a strategy to meet the medical bus requirement. Currently it is proposed to have a paratransit bus to meet selected ferries at Port Gamble to serve intra-county medical destinations in Silverdale and Bremerton. Medical destinations in Bremerton and Silverdale are clustered, in proximity to the Harrison Hospital facilities there. A bus that would also meet the ferry on an hourly basis would service the medical destinations in the Poulsbo area.

Medical bus service to Seattle will ride morning Bainbridge departures

To provide seamless connections to medical sites in Seattle it is proposed that Kitsap Transit would provide bus service that would meet five selected ferry arrivals at Port Gamble between the hours of 7:00 a.m. and 12:00 p.m. Service would continue on through to Seattle via the WSF Bainbridge ferry terminal making stops at identified medical destinations in Seattle. Departures from Seattle would be scheduled in the afternoon to meet departing Port Gamble ferries.

Next Steps

Transit requirements and strategies will be revisited and finalized in 2005

It is understood that the parameters set during the development of the conceptual plan were based on existing information and could change between now and the actual closure of the bridge in 2006. In addition, the passenger-only ferry service, which is an integral factor of the transit connection system, has not been finalized. The conceptual plan and requirements will be revisited by the WSDOT and transit agencies in early 2005 in order to develop further details of the plan (schedules, costs, etc.) and to formalize and secure agreements of service between the three transit agencies and WSDOT. This would allow the transit agencies sufficient time to ramp up personnel and equipment to be prepared for the 2006 closure.

5.0 MITIGATION COST ESTIMATES

Table 5-1 depicts estimated costs to implement Hood Canal Bridge Closure mitigation strategies. The cost estimates for the closure mitigation plan was set by the PMT at $10,000,000 (in construction year dollars). Public outreach efforts are standard elements in any WSDOT construction projects, and will be funded from the project's construction budget. The estimated cost identified in table 5-1 does not include cost associated with the incident management plan, which is still under consideration.

Table 5-1 – Estimated Closure Mitigation Cost (2006 Dollars)

Mitigation Strategy	Mitigation Budget	Other Sources
Preliminary Engineering		
✍✍Mitigation Design/Permitting Coordination	$815,000	
Alternate Route		
✍✍Temporary Improvements	$263,000	
✍✍Planned CIPP Projects*		$44,340,000
Passenger-Only Ferry		
✍✍Park & Ride/Ferry Terminal Construction and Right of Way ** (Port Gamble/South Point/Shine Pit)	$4,274,000	
✍✍Additional Right of Way	$500,000	
✍✍Park & Ride/Ferry Terminal Operations	$43,000	
✍✍Transit Operations	$1,710,000	
✍✍Passenger-Only Ferry Operation	$1,500,000	
✍✍Rideshare	$19,000	
Public Information		
✍✍Public Outreach		$750,000
✍✍Advance Signing	$30,000	
Medical Mitigation		
✍✍Medical Bus Service	$422,000	
Total	**$9,576,000**	**$45,090,000**

* Capital Improvement & Preservation Program

** Includes Real Estate Services costs

Traffic improvement strategies to alternate routes that motorists are expected to utilize during the 2006 closure of the Hood Canal Bridge and are considered temporary improvements would be funded by closure mitigation funds. Mitigation strategies of a permanent nature, such as the Mt Walker passing lanes would need to come out of reprioritization of other

funds in the WSDOT program. Permanent improvement/preservation projects in the WSDOT Capital Improvement & Preservation Program (CIPP) that could assist in minimizing traffic impacts of the bridge closure were identified based on availability of construction funding during the 03-05 and 05-07 biennium.

Appendix A

Hood Canal Bridge Travel Behavior Analysis

2002 Hood Canal Bridge
Travel Behavior Analysis

September 20, 2002

By

Washington State Department of Transportation

Olympic Region Planning Office
Corridor Planning Group

Contents

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Tables and Figures

Hood Canal Bridge - Travel Behavior Analysis

Background

Existing Data

The closure of the Hood Canal Bridge in 2006 will be a unique (or rare) event in the lives of the travellers who use it. In an effort to help identify the best mitigation strategy, a survey of bridge users was commissioned in 1998 (an Origin and Destination, or O&D study), with a followup survey completed in 2001. Unfortunately, the strategy ultimately selected, a passenger only ferry between South Point and Port Gamble (POF Option), was named only in the followup. Since the followup was primarily designed to determine interest and preferences between a number of various alternatives, the need has arisen recently to better define how travelers will likely react to the specific set of alternatives currently slated for implementation - the South Point/Port Gamble Passenger Only Ferry (POF Option) and the US101 detour (Detour Option).

In 2002, Larry Demich delivered a memorandum and addendum reporting traffic volumes for various alternative mitigation strategies during the closure. He predicted total trip volume reductions based on trip purpose, and distributed the remaining trips to the various mitigation alternatives using an organized, but undocumented process. The Demich study used trip purpose, as well as some subjective assumptions, to identify trip importance and traveler behavior. We believe that better data about trip importance can be derived from other 1998 O&D and 2001 followup survey indicators, such as information about trip duration, frequency, and personal vehicle requirements.

Proposed Study

In this study, a new method is proposed for evaluating traveler behavior using these other indicators. Trips identified in the survey served as the study baseline. These trips are evaluated using knowledge about the routes involved, and the answers to those questions in the surveys deemed most likely to be behavior predictors. Questions from the surveys are used to help define, or screen, the set of trips that would occur (defining questions), and partition those trips for analysis of their likely travel mode (partition questions). Once partitioned, trips are assigned a mode based on a ratio developed from assumptions about vehicle needs as expressed by the survey respondents. Total and medical only travel volumes for each of three trip alternatives (POF Option, Detour Option, and Deferred Option) are projected for the 2006 closure using these ratios. Volumes are reported in each alternative for each hour, weekdays and weekends, and for each travel destination for the POF Option.

Method

Introduction

This study was based on information about the travel routes developed using mapquest.com and the WSDOT State Highway Log, and responses to questions posed in the 1998 O&D study and the 2001 followup study. Survey records indicating multiple trips per week were counted as multiple records using the adjustment values provided by the O&D consultant. A logical analysis

of origins and destinations was also used to verify trip direction. Information was used for either screening or partitioning purposes. Trips that were screened from further study were assumed to either not occur (Deferred Option), or not be compatible with the POF Option. The remaining trips were assumed to be the set of all trips that would consider using the POF Option, but with varying degrees of favorability (or affinity). These trips were subjected to a partition analysis, in which these varying degrees of affinity were applied based on behavior assumptions about trips and travelers derived from 1998 and 2001 survey responses.

Route Analysis

The Detour and POF Options were analyzed to determine how much time each would take given the expected traffic conditions during closure (Table 1). Trips from common origins and destinations were tabulated and compared. The comparison revealed that the Detour Option, except for one origin/destination combination, will take between 15% and 30% longer than the POF Option. The remaining origin/destination pair, Port Townsend and Bremerton, represents an outlier in this data, as the duration of the Detour Option can be described as much longer than that of the POF option. The data seem to indicate that, in general, origins and destinations that lie closer to the bridge will incur a higher trip duration difference between the POF Option and the detour.

Table 1

Mitigation Alternatives - Round Trip Duration Comparisons (Hours)

(Assuming detour LOS E, transit requires 15 minute transfers)

Origin/Destination	*POF Option*	*Detour Option*	*Difference*	*Percent Increase*
Port Townsend to Seattle	5.83	7.28	1.45	25%
Port Townsend to Bremerton	4.17	6.12	1.95	47%
Port Townsend to Tacoma	5.17	6.28	1.12	22%
Port Angeles to Seattle	7.17	8.25	1.08	15%
Port Angeles to Bremerton	5.50	7.08	1.58	29%
Port Angeles to Tacoma	6.50	7.25	0.75	12%

Note: POF means passenger only ferry

Screening questions

Screening questions serve to eliminate trips in the O&D data set from consideration as possible POF Option users.

How important is the trip?

In O&D survey question 11, travelers were given the opportunity to describe how they would treat the trip in the absence of the bridge or any mitigation measure. One of the choices given in the survey was "reschedule". In this study, the “reschedule” response was used to indicate that

the trip associated with that response is not important enough, or time sensitive enough, to be made, compared to the trouble the traveler expected to find in using existing alternatives. Although its an imperfect measure since the POF Option was not offered in the survey, this response is taken as a strong indication that the traveler is averse to travel hassles, and that the trip will likely not happen during closure. To balance this effect, its anticipated that where this measurement may overestimate those who would stay away from our mitigation options, that the other answers to question 11, especially the "other" category, may overestimate them, as these others may actually favor the options that they chose or proposed over our mitigation options.

In conclusion, trips indicating this answer were screened from further analysis, and are assumed to not use either the POF or Detour Options during the 2006 closure.

Is the trip compatible with transit connections to the POF Option?

Although a variety of possibilities exist for continuing the journey once the traveler has arrived at the terminal, it's expected that those trips that can be served by transit will be make the POF Option most competitive against the detour. Survey codes used to describe the trip destination (Question 5) were used to screen out trips whose destinations lie outside of an area that the traveller could reasonably get to. The trips remaining in the dataset for further analysis were associated with the following destinations: Port Ludlow, Port Townsend, Poulsbo/Kingston, Bremerton, Sequim/PA, East Jefferson County, and Seattle. Trips not clearing this screening were automatically assigned to the Detour Option.

Partition Questions

Partition questions serve to classify trips into groups having homogeneous attraction, or affinity, to using the POF Option.

How much will the trip cost?

The Route Analysis indicated that shorter trips would offer increased advantage to the traveler using the POF Option. Based on the outlier pair described in that analysis, the remaining trips were partitioned into those having either proximate or non-proximate origins and destinations. The outlier pair was expanded to encompass all of the Kitsap Peninsula, so that the proximate origins and destinations were assumed to be Port Ludlow, Port Townsend, Poulsbo/Kingston, and Bremerton. Trips that were coded for one of these locations in both the origin and destination fields were flagged as proximate, the remaining trips as non-proximate.

There is no plan to charge users for the POF Option, or related transit connections. However, bridge users today are commonly factoring long drives and ferry fares into their trip, so the assumption was made that the dollar cost comparison between the POF Option and the Detour Option would not be a factor in traveler decisionmaking.

The premise used in introducing this partition was that shorter, or proximate, trips are more likely to use the POF Option.

How frequent is the trip?

The answer to this question provides insight into how motivated the traveler will be to change their habit of using their personal vehicle for the trip. The concept is that travelers who make trips that occur only once or twice a week would be more likely to endure the time cost of the detour route, instead of changing their habit of having their vehicle available on the trip. To measure this variable, the trip data was partitioned into frequent trips (greater than 2 per week) and non-frequent (1 or 2 per week) trips. The boundary between these groups is arbitrary, and results in an almost equal number of trips in each category on weekdays, but significantly more trips in the non-frequent category on weekends.

The premise used in introducing this partition was that frequent trips are more likely to use the POF Option.

Analysis

Trip Partitions

The affinity of travelers towards transit options like the POF Option is assumed for this analysis to be related to the trip partition groups. This affinity could be described as a continuous function of proximity and frequency, where those who live closest to the bridge (proximate) and travel most often (frequent) would tend to use the POF Option more, and those living very far (non-proximate) and not traveling often (non-frequent) would tend to use it less. For purposes of this study, this continuous function has been simplified by defining four discrete trip categories based on the partition categories described above. These categories were determined to be, in order of decreasing transit affinity:

- Proximate/Frequent
- Non-proximate/Frequent
- Proximate/Non-Frequent
- Non-proximate/Non-Frequent.

Mode Split

How important is my vehicle?

One approach to evaluating the affinity of travelers to transit solutions like the POF Option, and ultimately the split between trips using the POF and Detour Options, is to apply knowledge about their attitudes towards the need for personal vehicles on trips of this kind. In order to quantify these attitudes, a statistical trend was developed using the responses to question 29 found in the 2001 followup survey. In that question, travelers were asked how important it was, on a scale of 1 to 5, that their vehicle accompany them when using a ferry. Because of the format of the followup survey, an answer to this question is not assigned to each trip in our dataset. Therefore, an assumption was made that the response to the question indicated the intensity of actual or perceived vehicle importance on trips in general. In order to relate this general statistic to our

trip-specific information, assumptions were also needed to determine how this statistic might be reasonably distributed among the four trip categories.

In the 2001 followup survey 62% of respondents gave their highest rating (score equals 1) to the need for a vehicle on a ferry. Assuming that this statistic represents an average trip and traveler, then it's reasonable to assume that it also represents the mode split for a set of trips having an average affinity to the POF Option. Therefore, an affinity score for each trip, and especially one related to the four trip categories established in this study, would be useful in relating this response to the potential mode split in out mitigation scheme.

The trip categories used in this study are related to two trip measurements, proximity and frequency. If each of these measurements is assumed to contribute equally to the traveler's POF Option affinity, and have a value of one, then one way to score a trip's affinity is to tally the values for the measurements associated with each category. In reality, each trip would have a unique proximity and frequency score on a continuous scale, yielding a fractional affinity score occurring within a range surrounding these category scores. Using this continuous measurement model, a score of zero on our scale actually represents a trip that would never use the POF Option, and a score of 2 represents a trip that always would. To account for this variability, without introducing a process for determining where the actual boundary between categories occurs, its assumed that all of the trips in the middle two categories (non-proximate/frequent and proximate/non-frequent) have the average affinity score of 1, while trips in the two adjoining categories occupy the range between the extreme and average possible scores (See Table 2).

Using these assumptions, Figure 1 illustrates one method for determining vehicle need in each category using the question 29 statistic as a starting point. In the figure, the middle (or average) categories are assumed to have the average vehicle need score of 62%. The centroids of the areas representing the other two categories on the graph are assumed to represent the average scores for those categories, and vehicle need is assigned using each centroid's affinity score. The mode split in favor of the POF Option for each trip category is calculated by subtracting one from the these percentages. The results of this mode split analysis are shown in Table 3.

Table 2

Transity (POF Option) Affinity Scores for Each Trip Category

Trip Category	*Interpretation*	*Affinity Score*
Non-proximate/Non-frequent	Less transit affinity	0 to 1 (mean = 0.3)
Non-proximate/Frequent	Average transit affinity	1
Proximate/Non-frequent	Average transit affinity	1
Proximate/Frequent	More transit affinity	1 to 2 (mean = 1.3)

Note: mean scores are calculated using centroid of areas shown in Figure 1.

Table 3

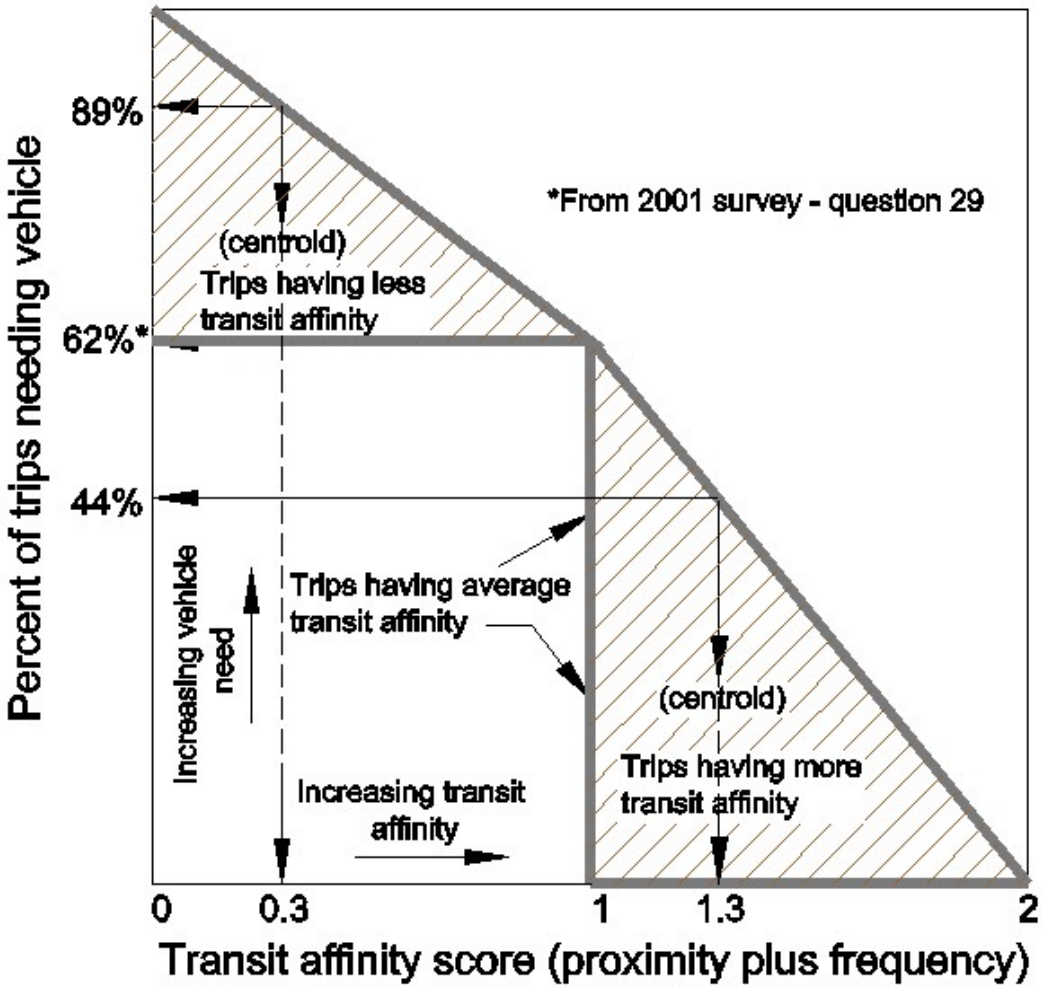
Mode Split Results by Trip Category

Category	*Detour Option affinity*	*POF Option affinity*
Proximate/Frequent	44%	56%
Proximate/Non-frequent	62%	38%
Non-proximate/Frequent	62%	38%
Non-proximate/Non-frequent	89%	11%

Figure 1

Assigning Vehicle Importance to Trips using

Transit (POF Option) Affinity Categories


89%
62%*
44%
Percent of trips needing vehicle
*From 2001 survey - question 29
(centroid)
Trips having less transit affinity
Trips having average transit affinity
Increasing vehicle need
Increasing transit affinity
(centroid)
Trips having more transit affinity
0
0.3
1
1.3
2
Transit affinity score (proximity plus frequency)

Is this trip during the daytime or nighttime?

The possibility exists that those who travel at night might react differently to the closure than daytime travelers. An analysis of variance was performed on data describing the study partitions, and the Deferred Option trips, in daytime and nighttime sets. This analysis showed that measurements of the statistics describing daytime and nighttime travelers appear to be assessing the same population. Based on this result, no distinction was made in either the study, or in its conclusions, based on time of day of travel.

What is the purpose of the trip?

Another way to measure the importance of a trip, and perhaps the willingness of the traveler to use transit services like the POF Option, is to apply assumptions about these issues based on the trip purposes. To verify that the procedure described in this study accounts for this effect, an investigation was made about how trip purposes are distributed in the 2006 hourly volume results obtained from this study (See Appendix A). Some key results were:

- The highest travel volumes, and highest percentages of POF Option patronage, were found in the work, school, and medical trips.
- The lowest percentages of deferred trips were found in the work, business, social, and medical categories.
- Morning and evening travel peaks were observed for weekday work trips in the POF and Detour Options, with other purposes filling in during the midday and evening hours.
- Work trips were observed to have the highest rate of POF Option usage.

These results are consistent with familiar expectations about the relative importance of the surveyed purposes. Therefore, no additional work was done to account for trip purpose in the final study results.

Results

Each trip reported in the survey was evaluated using the screening, partition, and vehicle importance rating process described above. In the final tabulation, trips were assigned to one of three categories – POF Option, Detour Option, or Deferred Option (rescheduled). Mode split results from Table 3 were applied to the survey sample in order to find out what the mode split ratios were in each hour of the survey for both weekend and weekday trips, for all trips in the survey, as well as for the medical trips only.

These survey results were extrapolated, again in hourly increments for all volumes as well as medical trips only, and for both weekdays and weekends, by scaling the sample population up to 2006 hourly volumes (developed from 1998 volumes using a 4.5% growth rate), and applying the mode split ratios described above. The results are shown in Tables 4 to 7. POF Option volumes shown in this report are assigned passenger/hour values in all cases by applying the average vehicle occupancy for weekdays and weekends indicated by the survey.

A study of the breakdown of POF Option trips by origins and destinations within the transit service area was also performed using the reports described above. The results of this breakdown are shown in Tables 8 through 15.

Conclusion

In this study, the number of trips associated with the POF and Detour Options were projected for the 2006 closure period using information from the O&D study about trip frequency, proximity, and vehicle need. Other information about willingness to reschedule and trip duration was also used. In general, results from the study are as follows:

POF Option	*Detour Option*
6400 passengers/day (weekdays)	10,500 vehicles/day (weekdays)
6600 passengers/day (weekends)	13,200 vehicles/day (weekends)
670 passengers/day (weekday/medical only)	1000 vehicles/day (weekday/medical only)
240 passengers/day (weekend/medical only)	340 vehicles/day (weekend/medical only)

Table 4

Weekday Trips during the 2006 Closure

	2006 Volumes			HCB PO	SR101	Deferred	POF (pass/hr)	Detour (veh/hr)	Deferred (veh/hr)
Time	West	East	Both						
1	71	28	100	30%	49%	33%	30	49	33
2	28	28	57	17%	51%	32%	17	28	19
3	28	28	57	17%	51%	32%	17	28	19
4	28	28	57	17%	51%	32%	17	28	19
5	28	185	213	28%	64%	8%	94	132	24
6	142	356	498	23%	64%	13%	179	296	93
7	427	526	953	24%	55%	22%	431	496	196
8	555	597	1152	17%	51%	32%	326	592	363
9	569	739	1308	14%	47%	38%	328	614	496
10	569	782	1351	12%	40%	49%	265	587	603
11	597	782	1379	14%	49%	37%	348	647	521
12	612	739	1351	18%	50%	32%	340	659	486
13	640	654	1294	15%	53%	32%	342	676	411
14	640	739	1379	18%	55%	27%	329	696	484
15	711	725	1436	16%	63%	21%	425	815	364
16	853	711	1564	22%	50%	28%	510	778	477
17	967	725	1692	19%	45%	36%	602	766	561
18	853	711	1564	20%	58%	22%	564	751	471
19	711	512	1223	16%	46%	38%	405	641	337
20	427	313	739	17%	51%	32%	287	352	213
21	427	242	668	17%	51%	32%	212	350	191
22	370	185	555	17%	51%	32%	165	272	182
23	213	156	370	17%	51%	32%	110	182	121
24	142	85	228	17%	51%	32%	68	112	75
	10609	10580	21189	18%	50%	32%	6411	10548	6758

Note: where the sample size in an hour drops below 10% of the maximum sample hour, then the average percentage mode splits are used.

Table 5

Weekend Trips during the 2006 Closure

	2006 Volumes			HCB PO	SR101	Deferred	POF (pass/hr)	Detour (veh/hr)	Deferred (veh/hr)
Time	West	East	Both						
1	156	71	228	25%	49%	36%	58	111	82
2	85	28	114	17%	51%	32%	29	55	41
3	57	28	85	17%	51%	32%	22	42	31
4	28	28	57	17%	51%	32%	14	28	20
5	85	85	171	28%	64%	8%	42	84	61
6	114	156	270	23%	64%	13%	67	134	96
7	341	270	612	24%	55%	22%	199	280	211
8	412	384	796	17%	51%	32%	164	397	300
9	569	484	1052	14%	47%	38%	207	535	392
10	782	640	1422	12%	40%	49%	270	603	655
11	939	796	1735	14%	49%	37%	415	806	678
12	924	953	1877	18%	50%	32%	456	904	697
13	967	867	1835	15%	53%	32%	403	882	708
14	981	853	1835	18%	55%	27%	463	836	718
15	995	953	1948	16%	63%	21%	465	999	667
16	995	995	1991	22%	50%	28%	576	960	682
17	995	1024	2019	19%	45%	36%	631	976	661
18	896	1052	1948	20%	58%	22%	545	1033	585
19	896	995	1891	16%	46%	38%	527	1094	478
20	711	711	1422	17%	51%	32%	271	712	546
21	668	540	1209	17%	51%	32%	303	730	295
22	484	427	910	17%	51%	32%	227	447	325
23	356	356	711	17%	51%	32%	177	350	254
24	256	142	398	17%	51%	32%	100	194	143
	13695	12842	26536	15%	50%	35%	6629	13193	9328

Note: where the sample size in an hour drops below 10% of the maximum sample hour, then the average percentage mode splits are used.

Table 6

Weekday Medical Trips during the 2006 Closure

Time	Trips	HCB PO	SR101	Deferred	POF (pass/hr)	Detour (veh/hr)	Deferred (veh/hr)
1	0	16%	48%	36%	0	0	0
2	0	16%	48%	36%	0	0	0
3	0	16%	48%	36%	0	0	0
4	3	16%	48%	36%	1	1	1
5	13	16%	48%	36%	3	6	5
6	13	16%	48%	36%	3	6	5
7	76	8%	38%	53%	11	29	40
8	114	16%	56%	28%	27	57	40
9	139	16%	67%	18%	36	84	33
10	161	8%	23%	69%	27	36	108
11	164	17%	52%	31%	58	76	53
12	171	25%	45%	29%	62	73	61
13	280	27%	45%	29%	122	144	63
14	213	27%	73%	0%	78	135	30
15	103	6%	45%	50%	32	55	28
16	147	28%	60%	13%	60	65	46
17	110	8%	32%	60%	13	58	45
18	144	16%	48%	36%	52	62	50
19	24	16%	48%	36%	10	18	0
20	110	16%	48%	36%	49	63	17
21	20	16%	48%	36%	5	9	7
22	0	16%	48%	36%	0	0	0
23	17	16%	48%	36%	0	17	0
24	19	16%	48%	36%	22	3	3
	2041	20%	49%	31%	672	1001	633

Note: where the sample size in an hour drops below 10% of the maximum sample hour, then the average percentage mode splits are used.

Table 7

Weekend Medical Trips during the 2006 Closure

Time	Trips	HCB PO	SR101	Deferred	POF (pass/hr)	Detour (veh/hr)	Deferred (veh/hr)
1	0	16%	48%	36%	0	0	0
2	0	16%	48%	36%	0	0	0
3	0	16%	48%	36%	0	0	0
4	0	16%	48%	36%	0	0	0
5	0	16%	48%	36%	0	0	0
6	0	16%	48%	36%	0	0	0
7	8	8%	38%	53%	1	3	5
8	11	16%	56%	28%	0	0	11
9	32	16%	67%	18%	10	15	11
10	6	8%	23%	69%	2	3	2
11	29	17%	52%	31%	11	12	10
12	17	25%	45%	29%	6	8	5
13	73	27%	45%	29%	40	35	13
14	106	27%	73%	0%	43	48	32
15	87	6%	45%	50%	16	46	31
16	96	28%	60%	13%	33	48	27
17	43	8%	32%	60%	9	19	18
18	68	16%	48%	36%	26	37	16
19	54	16%	48%	36%	29	36	0
20	26	16%	48%	36%	11	17	3
21	14	16%	48%	36%	6	10	0
22	0	16%	48%	36%	0	0	0
23	0	16%	48%	36%	0	0	0
24	0	16%	48%	36%	0	0	0
	670	22%	50%	28%	242	338	185

Note: where the sample size in an hour drops below 10% of the maximum sample hour, then the average percentage mode splits are used.

Table 8

Weekday POF Trips by Destination during the 2006 Closure

Time	Pt Lud	Pt Town	Poulsbo	Brem	E Jeff	Sequim/PA	Seattle
1	17	0	0	0	0	5	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	9	0
4	0	0	0	0	0	0	8
5	1	3	23	55	2	2	8
6	29	9	94	31	0	5	12
7	51	120	111	60	8	46	35
8	24	58	58	70	10	69	36
9	26	56	56	78	17	54	40
10	32	41	84	51	1	41	15
11	68	54	63	62	4	42	54
12	40	48	77	111	5	33	25
13	60	55	7	101	11	51	56
14	35	37	100	95	8	27	27
15	95	66	50	127	6	63	17
16	71	103	171	83	7	70	4
17	188	109	131	62	30	48	34
18	159	140	0	239	12	15	0
19	74	115	74	51	15	62	14
20	81	99	90	0	0	18	0
21	18	73	0	0	5	46	0
22	0	0	0	0	74	38	0
23	17	22	45	0	0	26	0
24	5	0	8	8	0	38	8
	1091	1207	1243	1284	217	811	394

Figures shown are passengers per hour

Table 9

Weekday POF Trips by Origin during the 2006 Closure

Time	Pt Lud	Pt Town	Poulsbo	Brem	E Jeff	Sequim/PA	Seattle
1	0	0	0	0	0	0	22
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	8	0	0	0	0	0	0
5	0	45	2	7	20	21	0
6	0	94	16	26	0	43	2
7	39	99	140	73	13	56	11
8	30	70	59	90	26	39	13
9	16	114	97	33	8	38	23
10	7	94	43	53	25	24	20
11	25	92	74	83	32	29	12
12	31	66	70	41	23	94	15
13	73	44	53	101	36	11	23
14	0	151	27	53	36	36	27
15	24	147	119	82	0	22	30
16	0	238	127	103	0	20	22
17	0	117	137	151	49	61	89
18	0	0	148	104	0	239	73
19	0	74	98	145	0	65	23
20	0	71	75	63	0	19	59
21	0	0	0	82	0	0	61
22	0	0	112	0	0	0	0
23	0	45	0	0	0	0	65
24	0	16	0	0	9	0	43
	254	1577	1398	1289	276	814	631

Figures shown are passengers per hour

Table 10

Weekend POF Trips by Destination during the 2006 Closure

Time	Pt Lud	Pt Town	Poulsbo	Brem	E Jeff	Sequim/PA	Seattle
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	7	0	0	0
5	0	0	0	0	0	22	0
6	0	30	0	0	0	0	0
7	79	25	51	7	0	20	16
8	34	24	17	38	19	15	17
9	44	29	36	43	7	22	26
10	34	36	78	40	31	33	18
11	128	79	44	88	10	33	33
12	50	158	100	91	0	34	23
13	54	84	75	93	10	50	36
14	108	70	72	109	24	46	32
15	99	70	83	96	26	48	43
16	127	132	114	97	30	42	34
17	129	109	114	146	29	64	39
18	110	78	116	112	11	72	45
19	107	91	67	122	11	69	60
20	78	42	31	59	6	32	23
21	66	57	53	54	20	31	21
22	29	70	0	100	0	27	0
23	0	0	0	0	0	0	0
24	0	0	9	23	0	0	2
	1278	1183	1061	1326	234	661	469

Figures shown are passengers per hour

Table 11

Weekend POF Trips by Origin during the 2006 Closure

Time	Pt Lud	Pt Town	Poulsbo	Brem	E Jeff	Sequim/PA	Seattle
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	7	0	0	0	0	0
5	0	0	22	0	0	0	0
6	0	0	30	0	0	0	0
7	12	30	71	48	17	15	6
8	16	35	28	58	4	16	5
9	23	46	43	26	17	19	32
10	0	82	76	55	20	34	4
11	43	75	120	100	0	47	29
12	24	108	0	176	0	83	66
13	25	107	63	77	28	44	59
14	47	87	99	120	30	49	30
15	48	136	121	92	16	22	30
16	16	148	135	144	33	48	52
17	48	164	173	101	34	54	57
18	40	136	138	79	28	69	55
19	72	66	76	132	14	97	70
20	38	31	68	38	36	7	52
21	12	99	62	57	3	14	56
22	0	100	6	51	0	0	69
23	0	0	0	0	0	0	0
24	0	17	0	0	0	17	0
	467	1474	1330	1355	282	634	671

Figures shown are passengers per hour

Table 12

Weekday Medical POF Trips by Destination during the 2006 Closure

Time	Pt Lud	Pt Town	Poulsbo	Brem	E Jeff	Sequim/PA	Seattle
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	1
6	0	0	10	0	0	0	0
7	0	0	0	4	0	0	2
8	0	0	0	10	0	0	11
9	0	9	11	5	0	0	10
10	10	0	17	0	0	0	8
11	9	22	11	11	0	0	12
12	0	3	6	31	0	0	7
13	16	0	14	43	20	10	17
14	19	0	18	47	0	4	0
15	8	15	0	0	0	8	3
16	0	46	5	15	0	0	1
17	0	0	2	0	0	9	0
18	0	51	0	0	0	0	0
19	0	6	0	0	0	2	0
20	0	59	0	0	0	0	0
21	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0
24	0	0	0	0	0	1	0
	62	213	93	165	20	34	73

Figures shown are passengers per hour

Table 13

Weekday Medical POF Trips by Origin during the 2006 Closure

Time	Pt Lud	Pt Town	Poulsbo	Brem	E Jeff	Sequim/PA	Seattle
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	1	0
6	0	10	0	0	0	0	0
7	0	1	0	0	0	5	0
8	8	1	0	0	7	5	0
9	0	14	9	0	0	12	0
10	7	15	10	0	0	3	0
11	6	24	16	16	3	0	0
12	0	16	0	0	0	28	0
13	27	26	18	18	16	4	10
14	12	53	0	22	0	0	0
15	0	2	10	10	0	2	11
16	0	10	15	31	0	12	0
17	0	0	0	0	2	0	9
18	0	0	22	0	0	0	30
19	0	0	0	6	0	0	2
20	0	0	0	32	0	0	28
21	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0
24	0	0	0	0	0	0	1
	59	172	99	135	29	71	91

Figures shown are passengers per hour

Table 14

Weekend Medical POF Trips by Destination during the 2006 Closure

Time	Pt Lud	Pt Town	Poulsbo	Brem	E Jeff	Sequim/PA	Seattle
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	8	0	0	0
10	0	0	0	0	0	0	9
11	0	0	0	0	0	0	13
12	0	0	0	0	0	0	0
13	13	13	5	3	0	30	0
14	31	7	1	8	0	2	2
15	6	0	0	3	0	2	4
16	0	14	6	4	2	8	1
17	0	0	0	2	0	4	0
18	17	0	0	3	0	3	4
19	4	4	0	3	0	1	0
20	0	0	0	0	0	0	0
21	0	8	0	0	0	0	0
22	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0
	71	46	13	34	2	49	34

Figures shown are passengers per hour

Table 15

Weekend Medical POF Trips by Origin during the 2006 Closure

Time	Pt Lud	Pt Town	Poulsbo	Brem	E Jeff	Sequim/PA	Seattle
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	8	0	0	0
10	0	0	0	0	0	0	9
11	0	0	0	0	0	0	13
12	0	0	0	0	0	0	0
13	13	13	5	3	0	30	0
14	31	7	1	8	0	2	2
15	6	0	0	3	0	2	4
16	0	14	6	4	2	8	1
17	0	0	0	2	0	4	0
18	17	0	0	3	0	3	4
19	4	4	0	3	0	1	0
20	0	0	0	0	0	0	0
21	0	8	0	0	0	0	0
22	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0
	71	46	13	34	2	49	34

Figures shown are passengers per hour

Appendix A

Trip Purpose Analysis

Trip Purpose Analysis

The results of the analysis described in this report were examined for the breakdown of predicted 2006 trips by trip purpose, using the ratios of those trips identified in the O&D Study as a guideline. The analysis was run on each trip purpose by creating subsets of the O&D data for each purpose that were identified as being associated with that purpose only. The results of these subset analyses were compared with the general results and scaled to insure that the sum of the analysis was the same as the general analysis. This was necessary because some of the O&D trips (10%) did not specify a purpose, or identified multiple purposes. These omissions are assumed to have no effect on the trip statistics studied.

Some of the findings of this examination, and the figures that are associated with the findings, are listed below:

- ?? Figure A-1 - Work trips peak on the POF Option in the AM and PM hours.
- ?? Figure A-1 - Non-work trips dominate the POF Option during midday and evening hours on weekdays.
- ?? Figure A-2 - Work trips peak on the Detour Option in the AM and PM on weekdays.
- ?? Figure A-2 - Non-work trips dominate most hours on Detour Option
- ?? Figure A-2 - Higher Personal/Social/Recreation trip volumes are found on the Detour Option on the weekdays.
- ?? Figure A-3 - Higher Personal/Social/Recreation trip volumes are deferred (Deferred Option) than use the POF Option on the weekdays.
- ?? Figure A-3 - The Deferred Option handles the lowest volume of work trips on the weekdays.
- ?? Figure A-11 - Work trips are the most common, followed by personal and business trips on the weekdays.
- ?? Figure A-11 - Work trips see the lowest percentage of trips using the Detour or Deferred Options on the weekdays.
- ?? Figure A-12 - Work trips peak on the POF Option in the AM and PM on the weekend
- ?? Figure A-13 - Recreation trip volumes are prominent on the Detour Option on the weekend.
- ?? Figure A-14 - Personal and recreation trip volumes are prominent on the Deferred Option on the weekend.
- ?? Figure A-22 - Recreation trips are nearly as important as work trips on the weekend, and they seem to use the POF Option much less.
- ?? Figure A-22 - School trips are more important on the weekend, and are a prominent use of the POF Option on those days.
- ?? Figure A-22 - Trip purposes besides work are more important components of the travel mix on the weekend, except that business trips seem relatively unimportant.

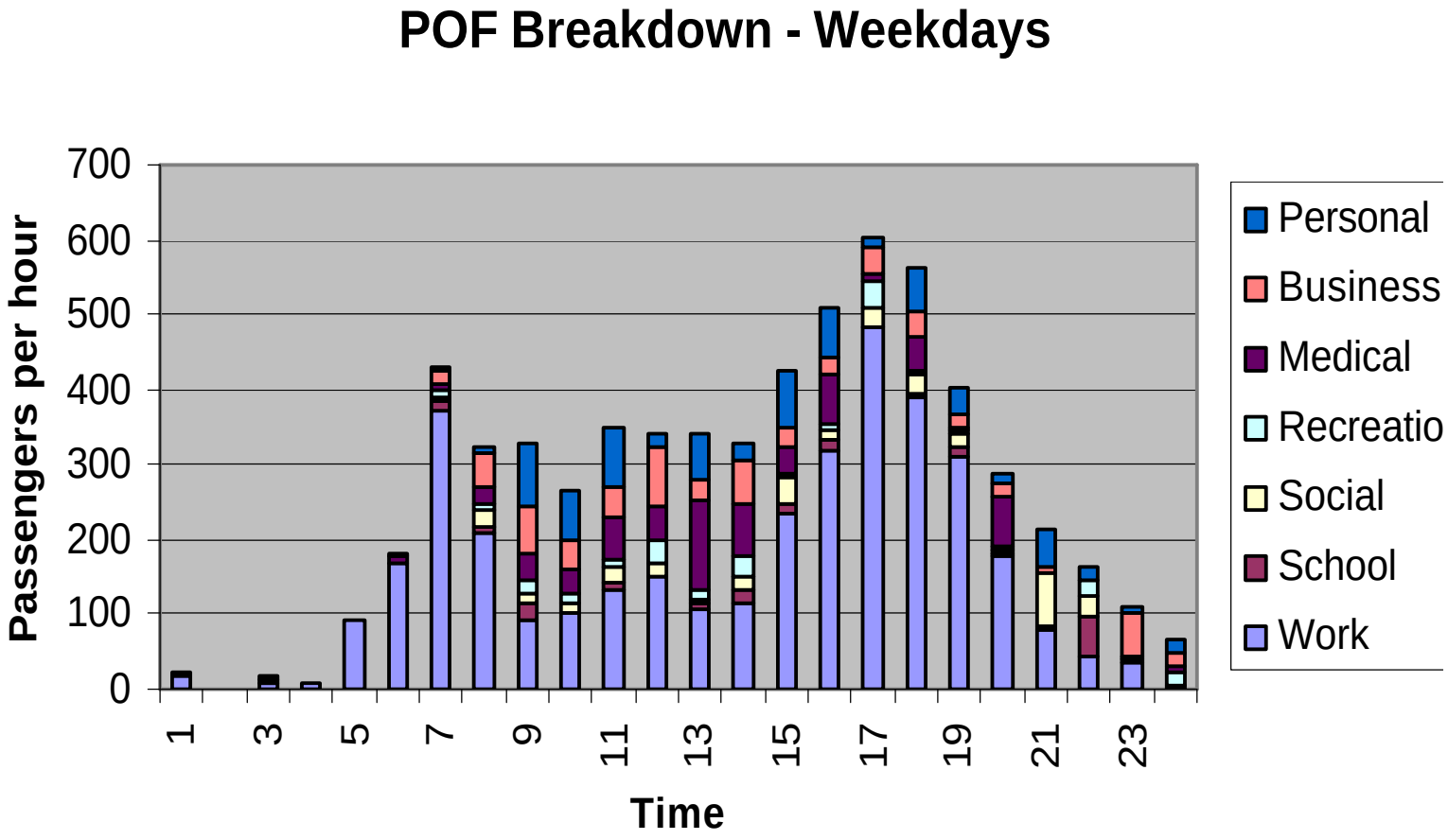

POF Breakdown - Weekdays
Passengers per hour
700
600
500
400
300
200
100
0
1
3
5
7
9
11
13
15
17
19
21
23
Time
Personal
Business
Medical
Recreatio
Social
School
Work

Figure A-1

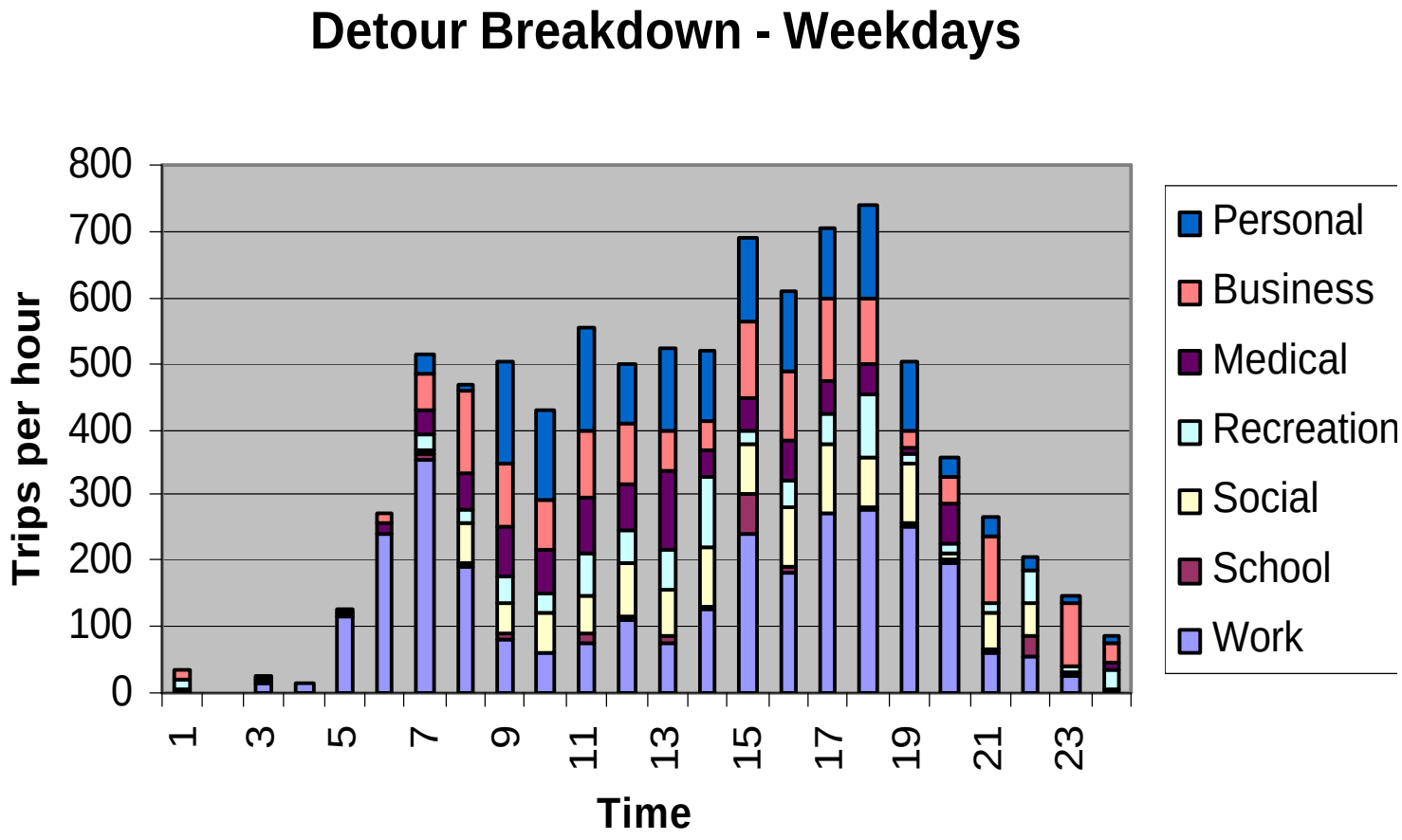

Detour Breakdown - Weekdays
Trips per hour
800
700
600
500
400
300
200
100
0
1
3
5
7
9
11
13
15
17
19
21
23
Time
Personal
Business
Medical
Recreation
Social
School
Work

Figure A-2

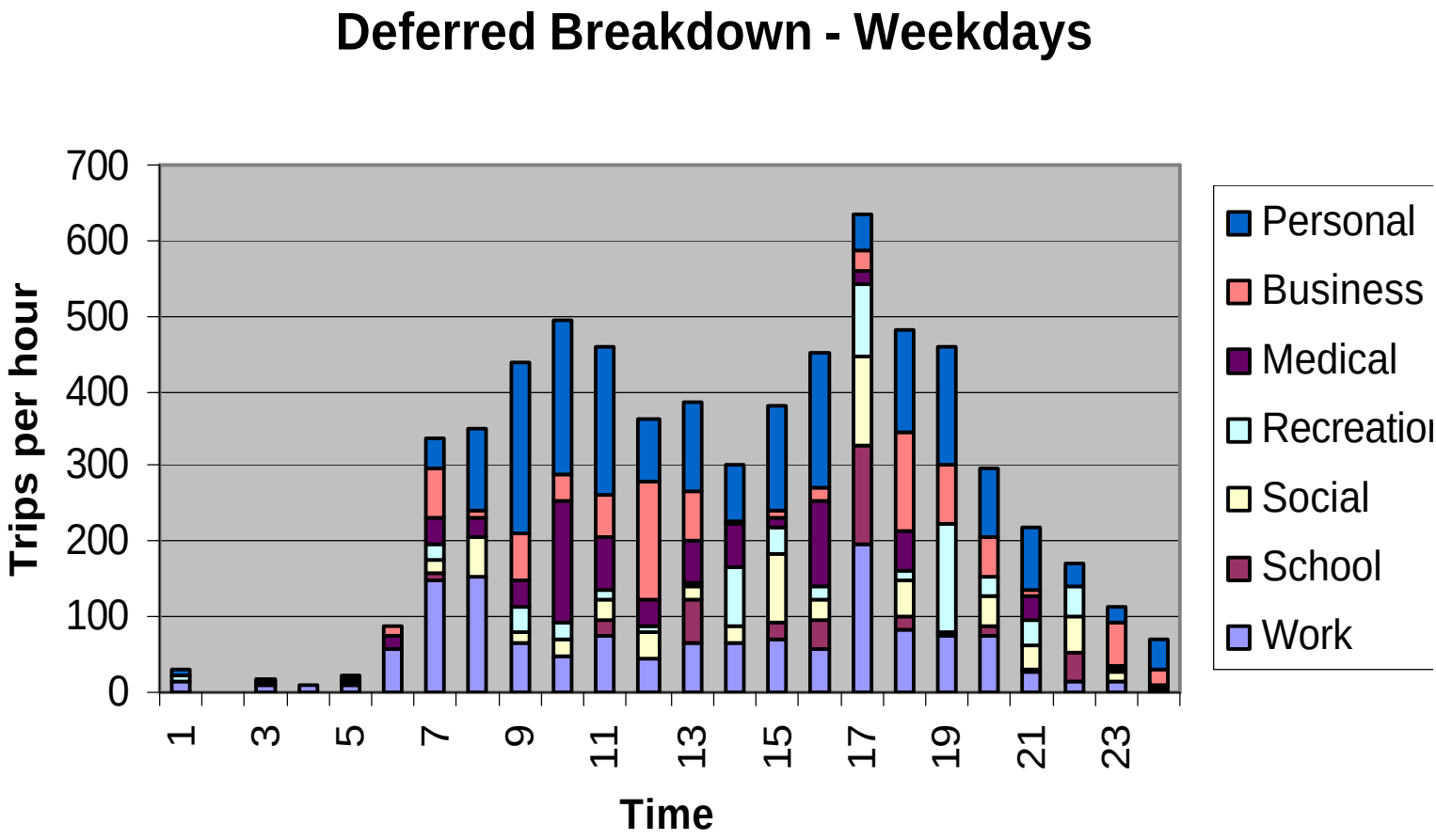

Deferred Breakdown - Weekdays
Trips per hour
700
600
500
400
300
200
100
0
1
3
5
7
9
11
13
15
17
19
21
23
Time
Personal
Business
Medical
Recreatio
Social
School
Work

Figure A-3

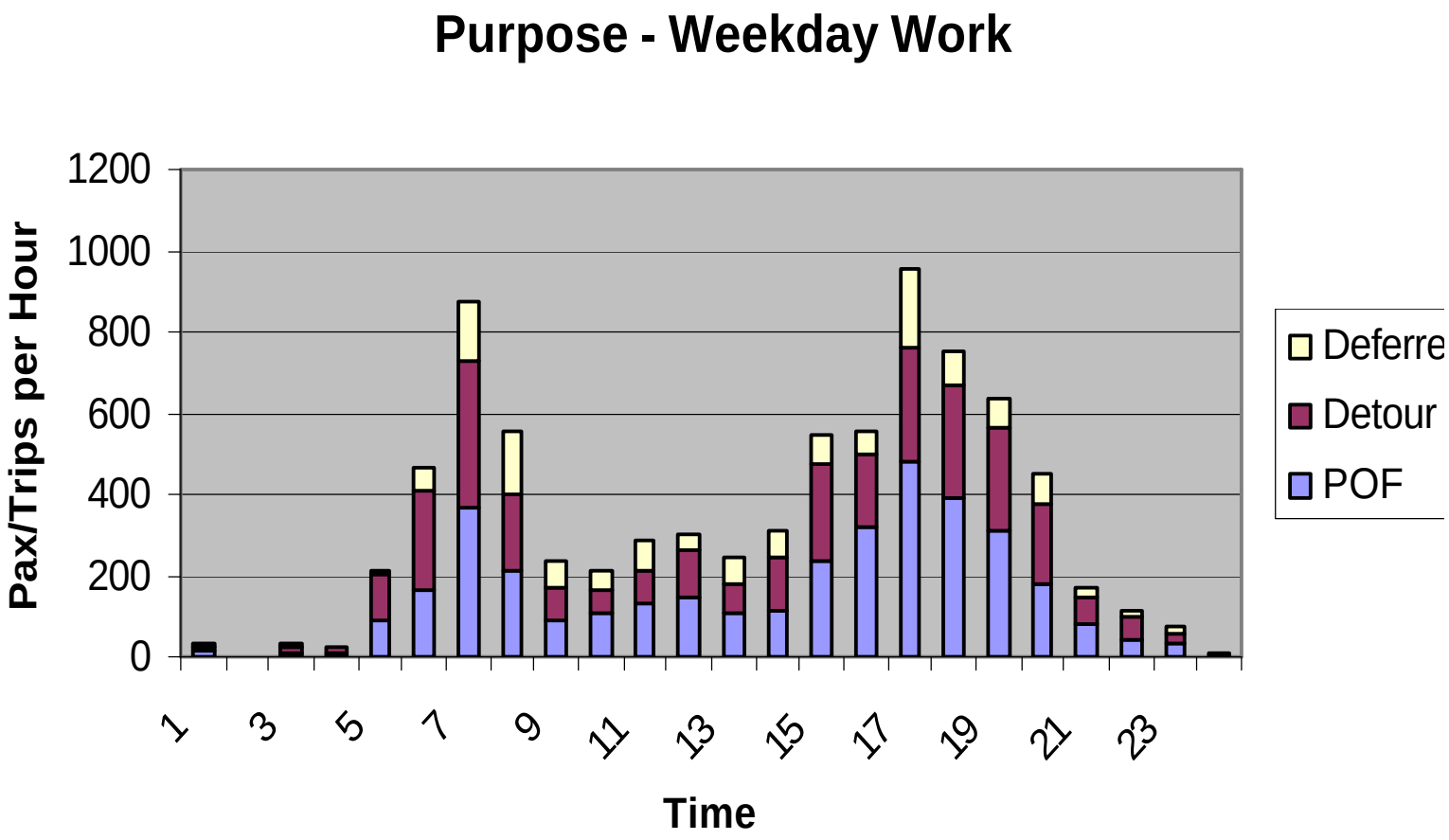

Purpose - Weekday Work
Pax/Trips per Hour
1200
1000
800
600
400
200
0
1
3
5
7
9
11
13
15
17
19
21
23
Time
Deferre
Detour
POF

Figure A-4

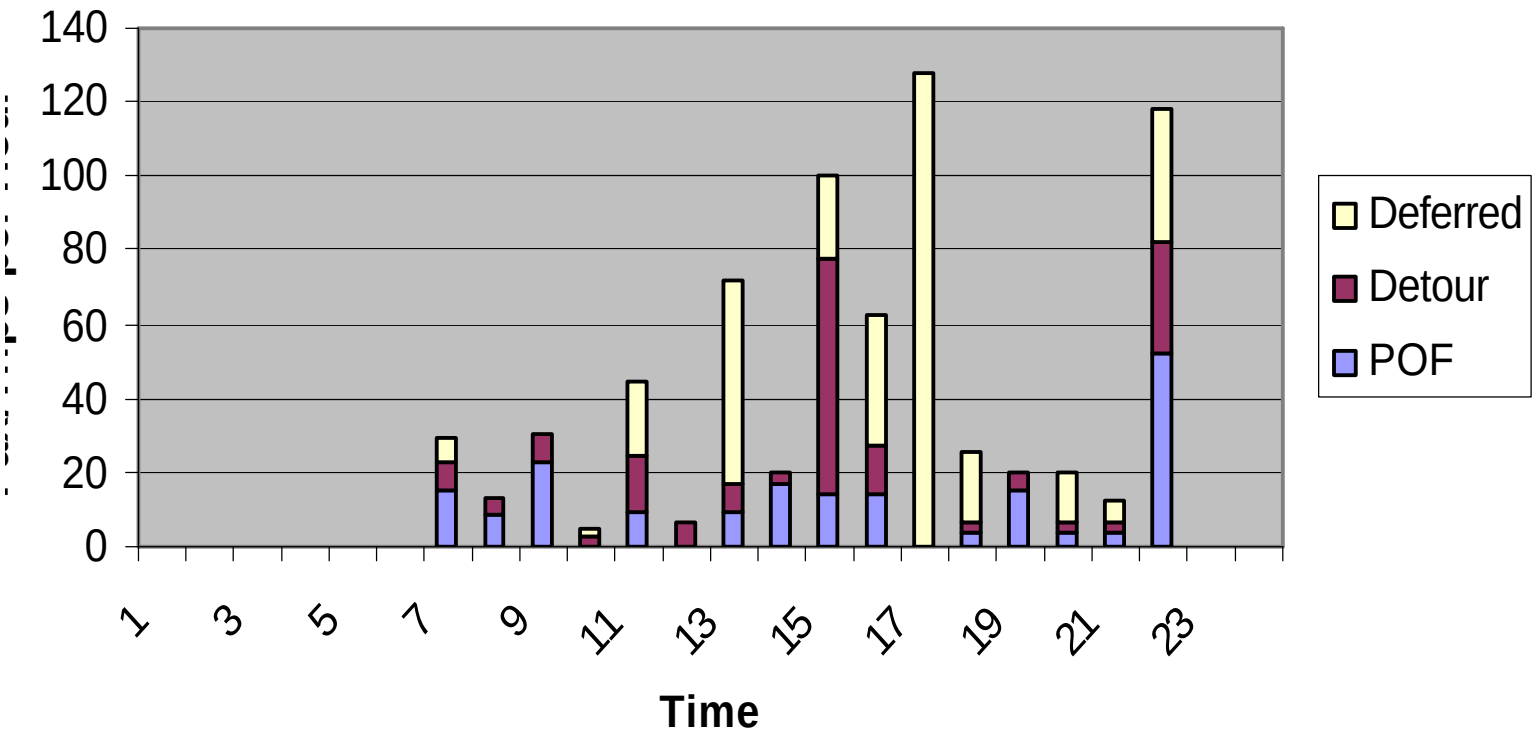

Purpose - Weekday School
140
120
100
80
60
40
20
0
1
3
5
7
9
11
13
15
17
19
21
23
Time
Deferred
Detour
POF

Figure A-5

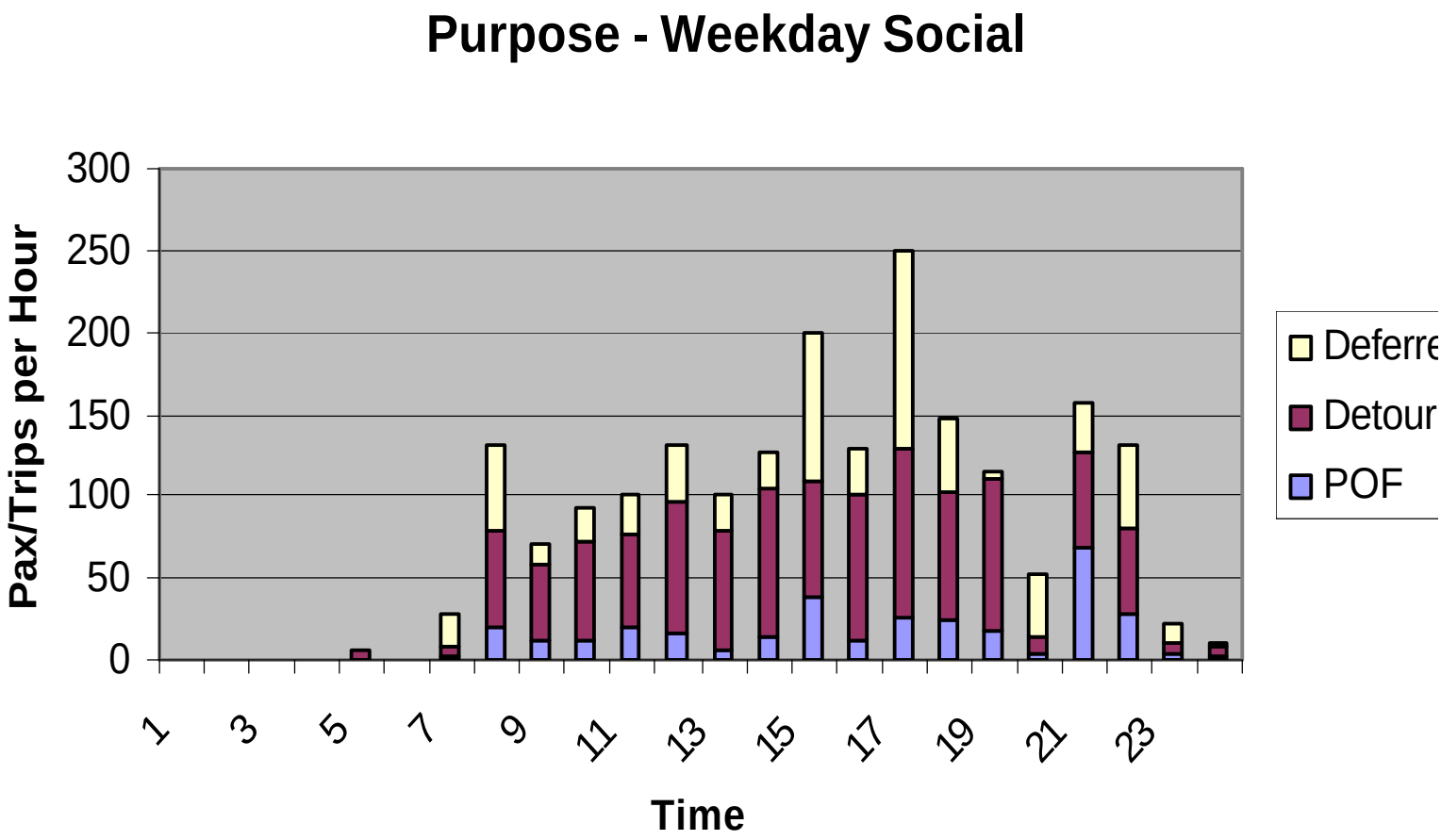

Purpose - Weekday Social
Pax/Trips per Hour
300
250
200
150
100
50
0
1
3
5
7
9
11
13
15
17
19
21
23
Time
Deferre
Detour
POF

Figure A-6

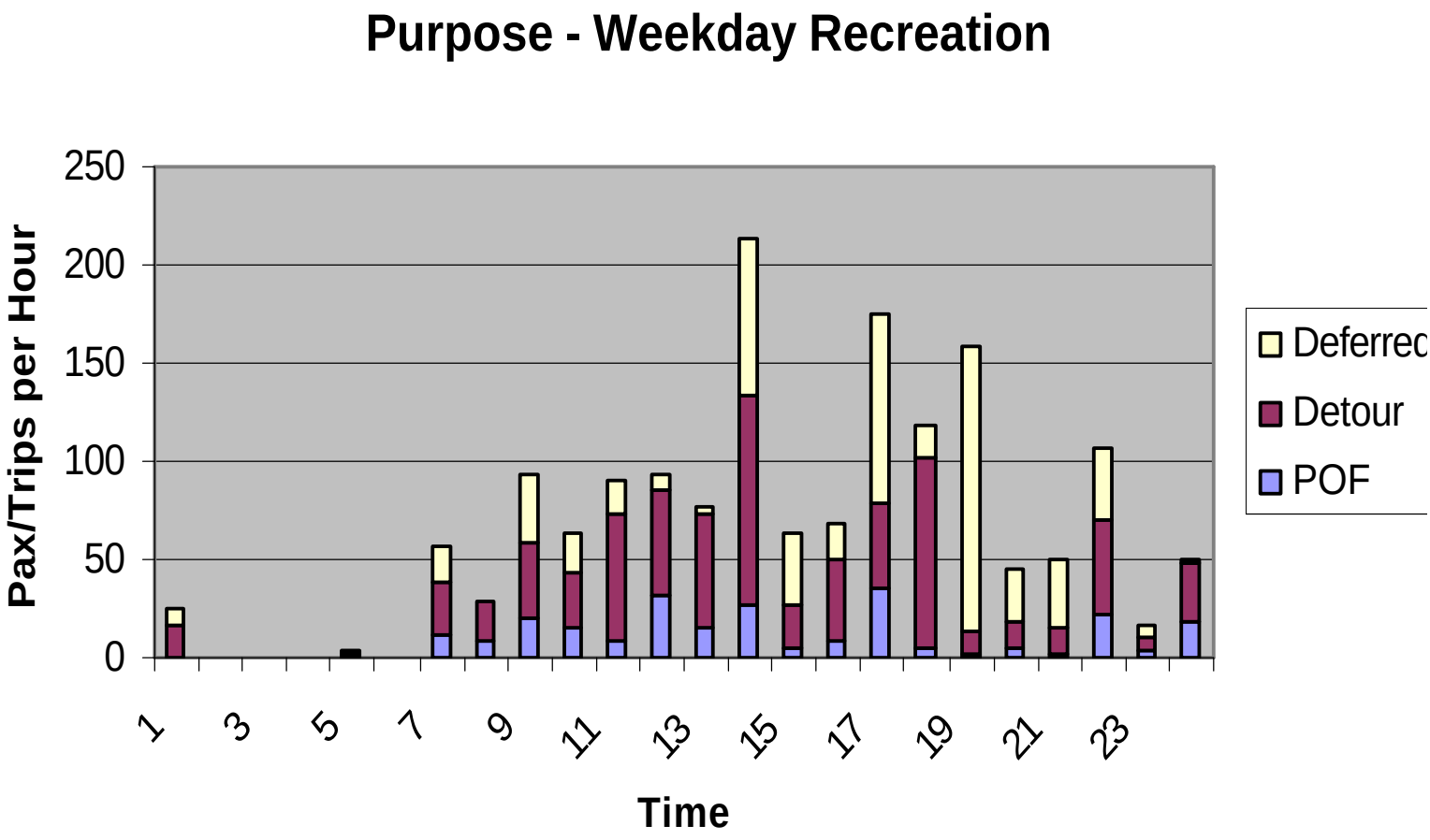

Purpose - Weekday Recreation
Pax/Trips per Hour
250
200
150
100
50
0
1
3
5
7
9
11
13
15
17
19
21
23
Time
Deferrec
Detour
POF

Figure A-7

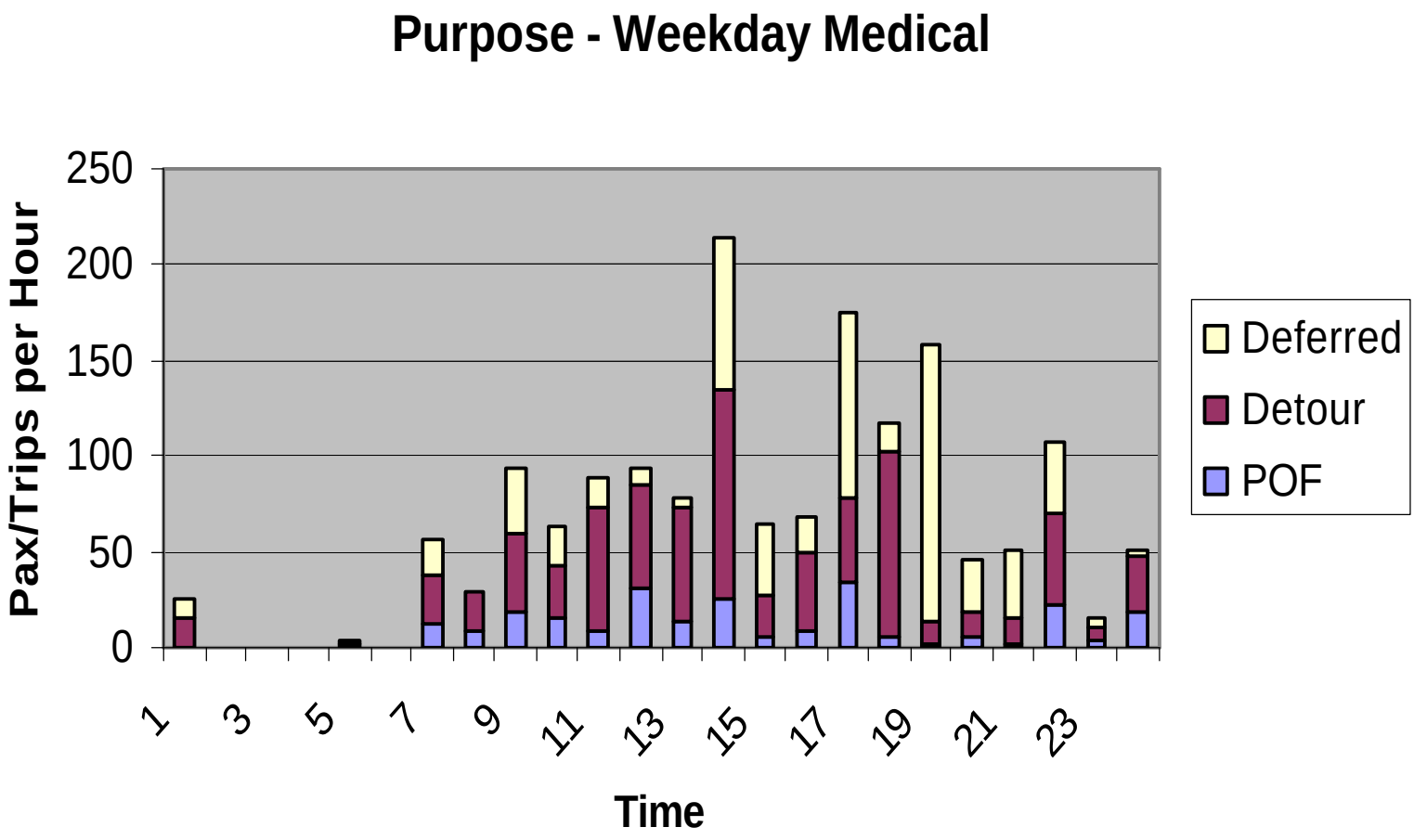

Purpose - Weekday Medical
Pax/Trips per Hour
250
200
150
100
50
0
1
3
5
7
9
11
13
15
17
19
21
23
Time
Deferred
Detour
POF

Figure A-8

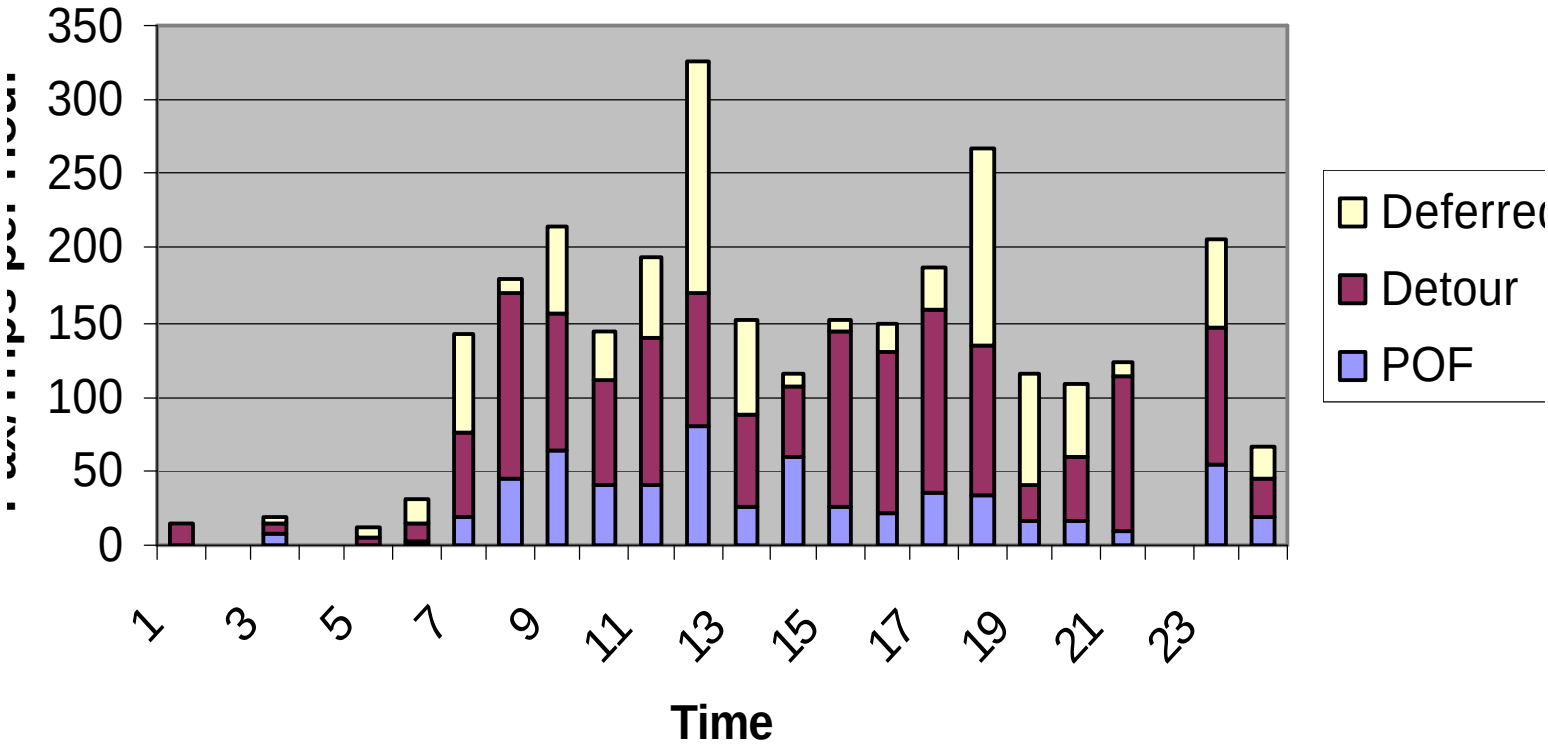

Purpose - Weekday Business
350
300
250
200
150
100
50
0
1
3
5
7
9
11
13
15
17
19
21
23
Time
Deferred
Detour
POF

Figure A-9

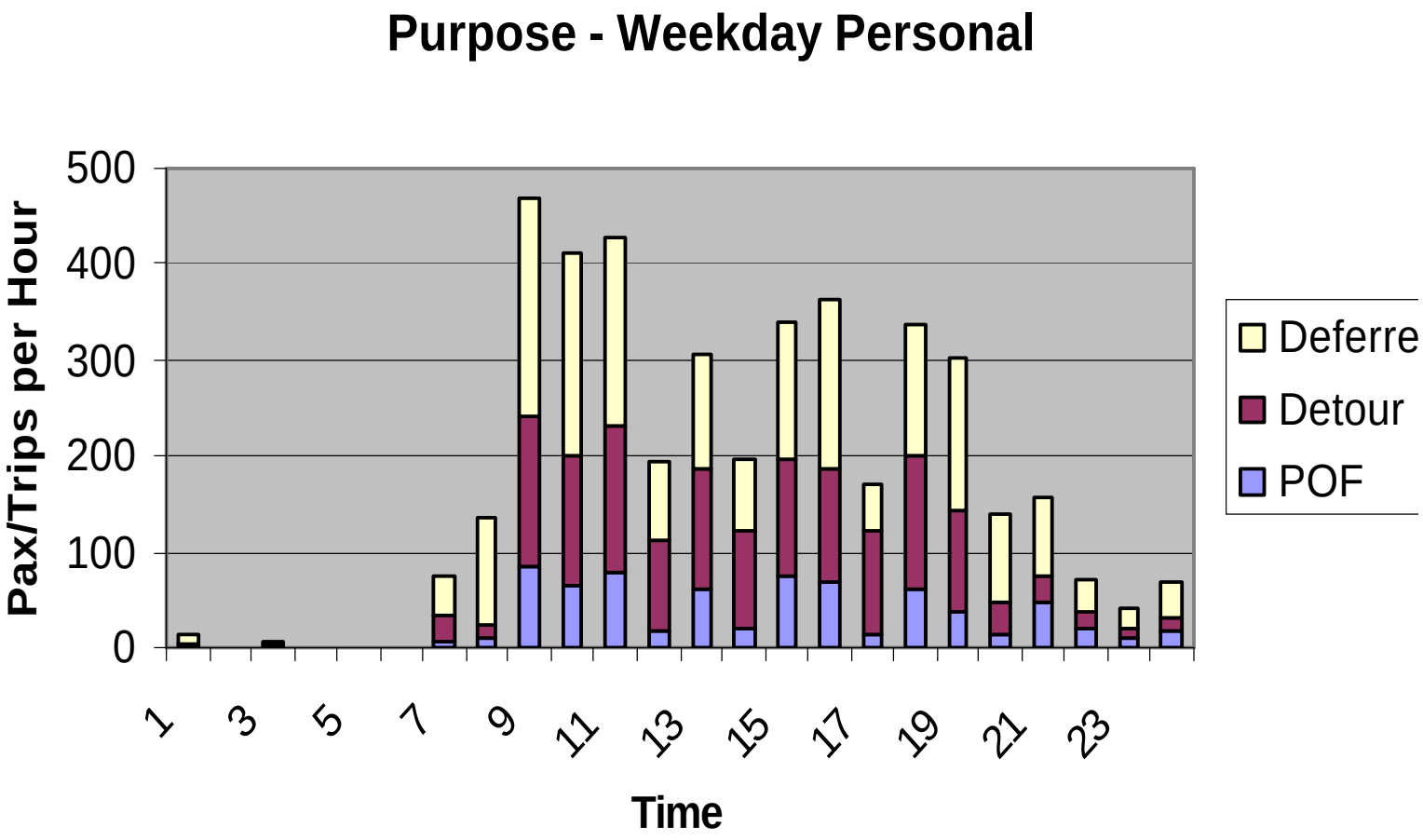

Purpose - Weekday Personal
Pax/Trips per Hour
500
400
300
200
100
0
1
3
5
7
9
11
13
15
17
19
21
23
Time
Deferre
Detour
POF

Figure A-10

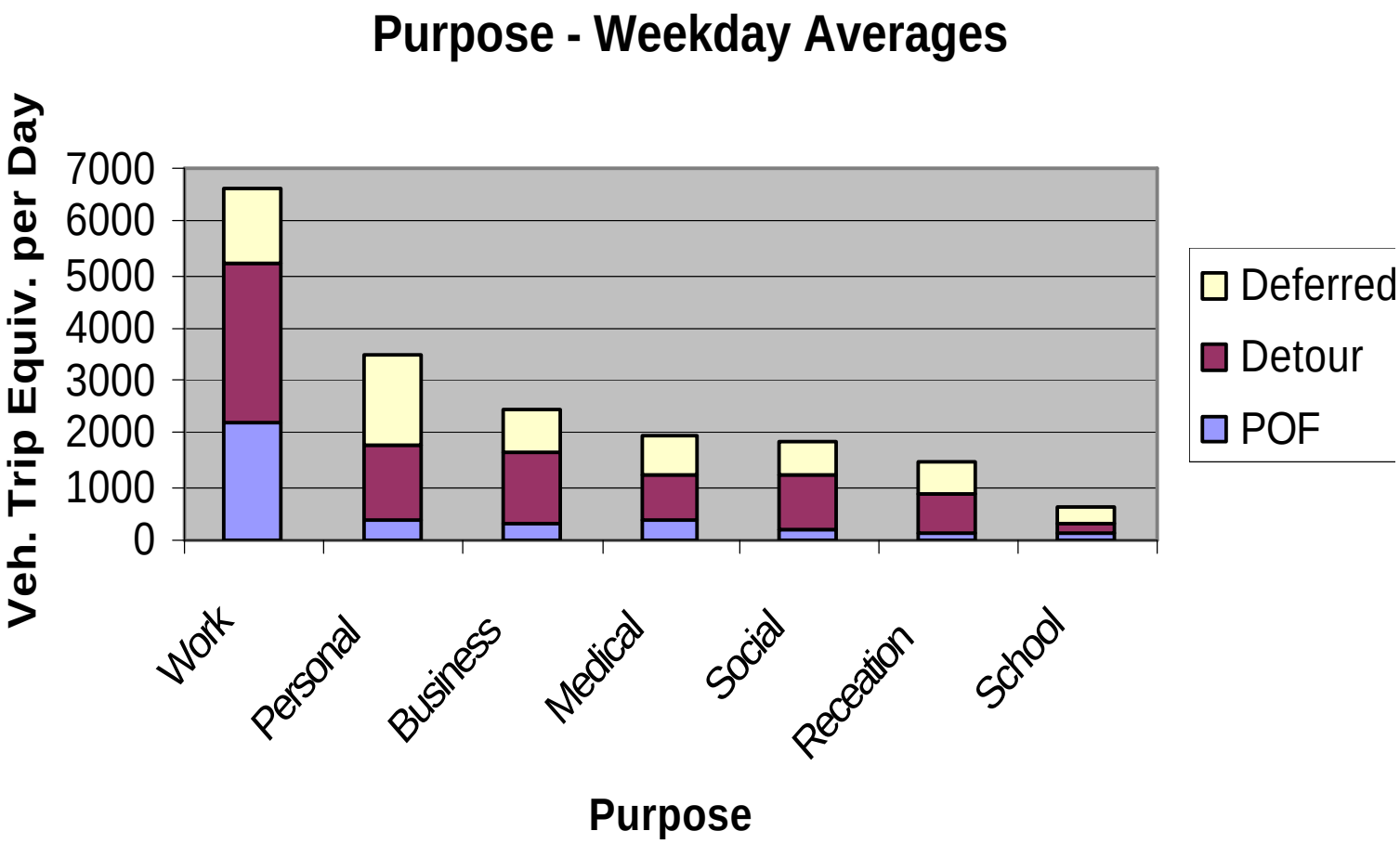

Purpose - Weekday Averages
Veh. Trip Equiv. per Day
7000
6000
5000
4000
3000
2000
1000
0
Work
Personal
Business
Medical
Social
Receation
School
Purpose
Deferred
Detour
POF

Figure A-11

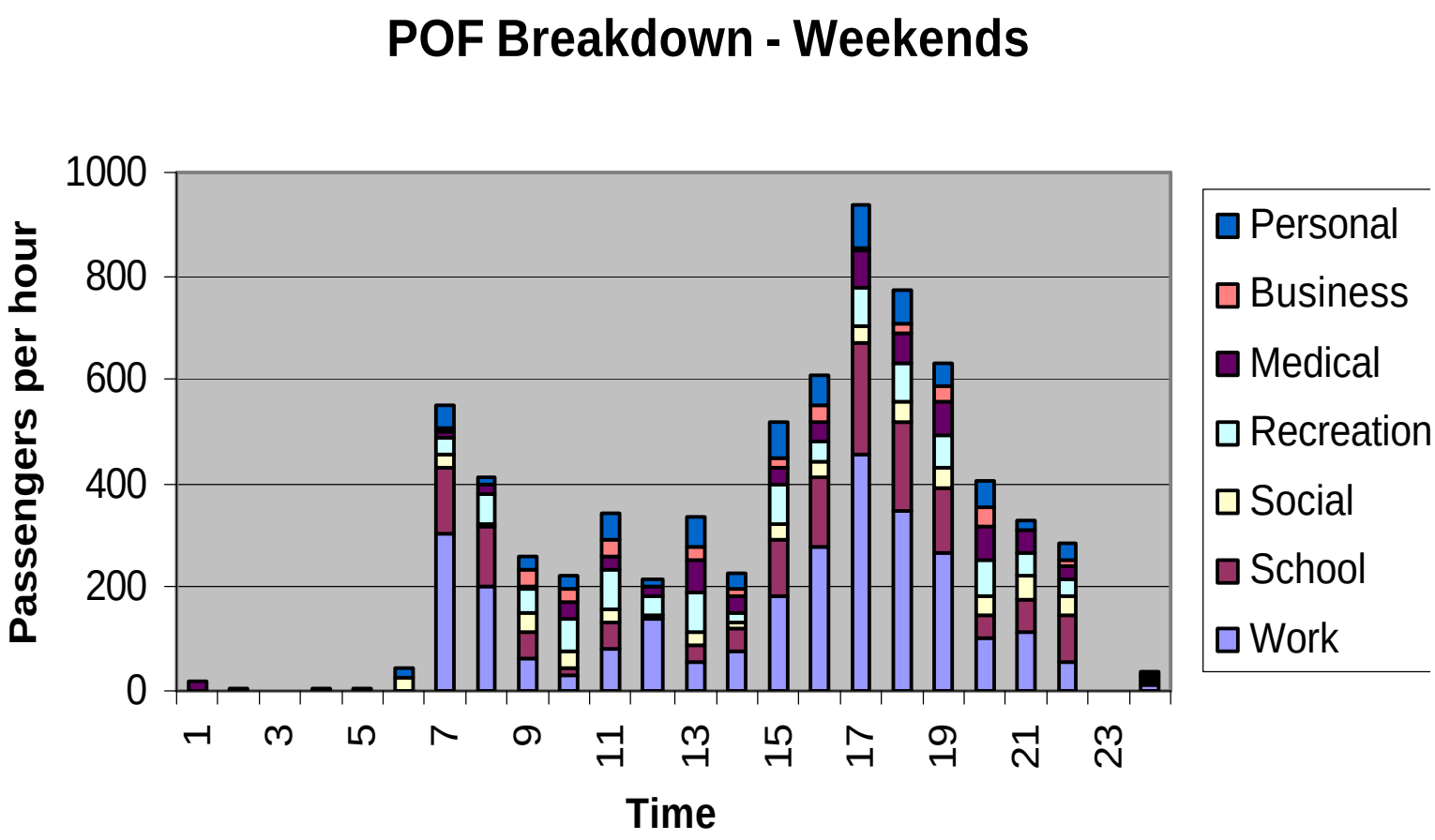

POF Breakdown - Weekends
Passengers per hour
1000
800
600
400
200
0
1
3
5
7
9
11
13
15
17
19
21
23
Time
Personal
Business
Medical
Recreation
Social
School
Work

Figure A-12

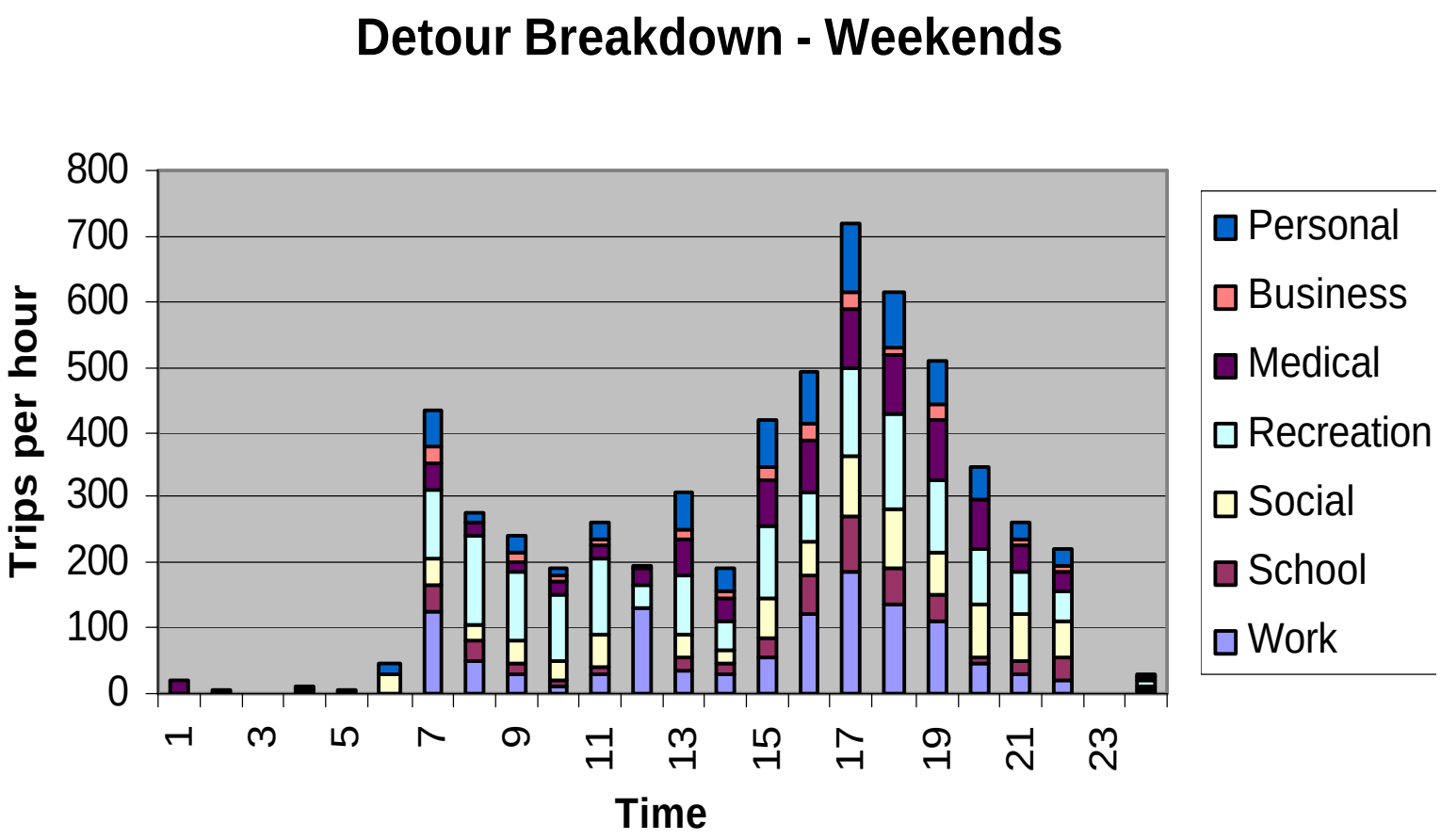

Detour Breakdown - Weekends
Trips per hour
800
700
600
500
400
300
200
100
0
1
3
5
7
9
11
13
15
17
19
21
23
Time
Personal
Business
Medical
Recreation
Social
School
Work

Figure A-13

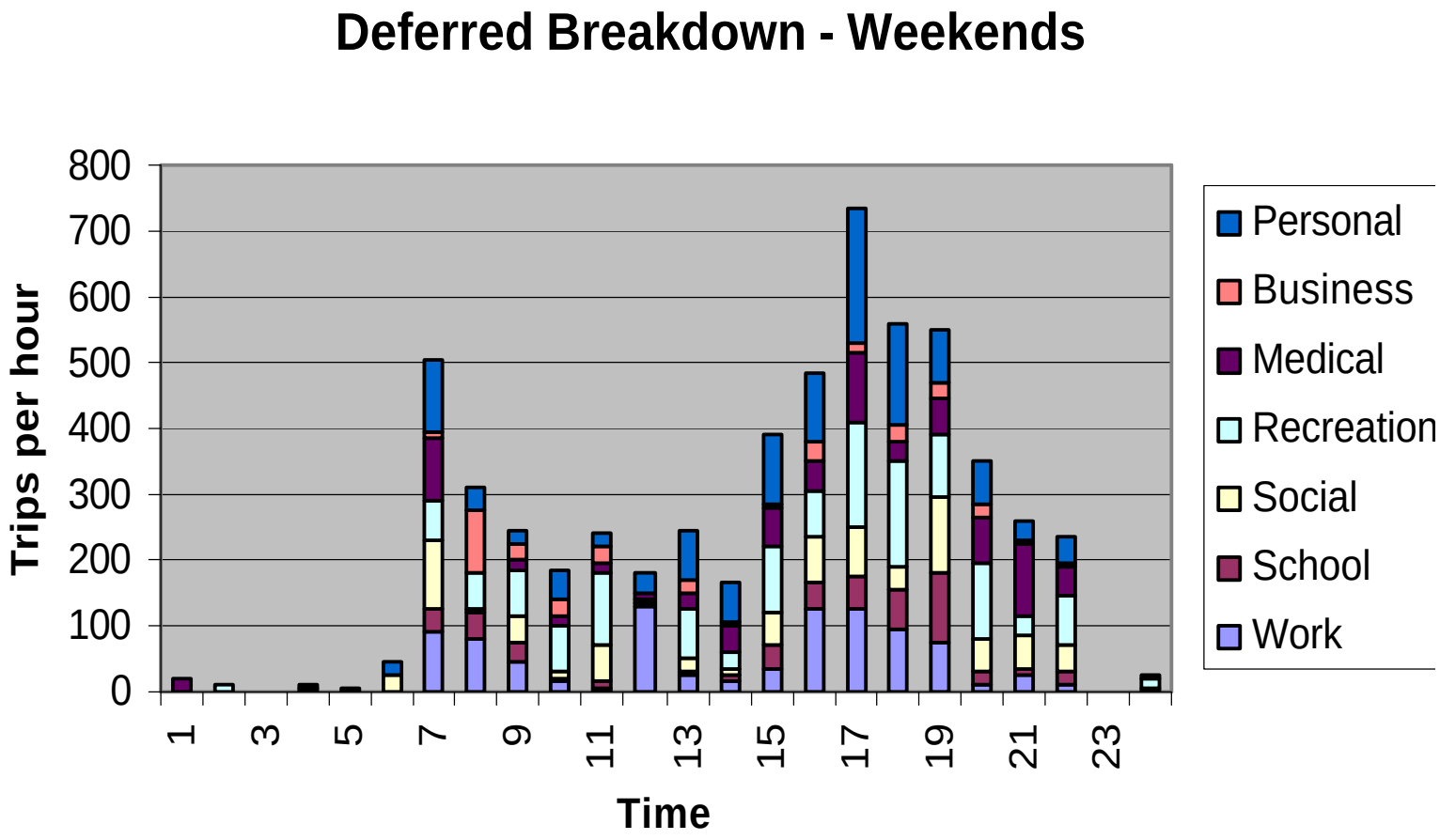

Deferred Breakdown - Weekends
Trips per hour
800
700
600
500
400
300
200
100
0
1
3
5
7
9
11
13
15
17
19
21
23
Time
Personal
Business
Medical
Recreation
Social
School
Work

Figure A-14

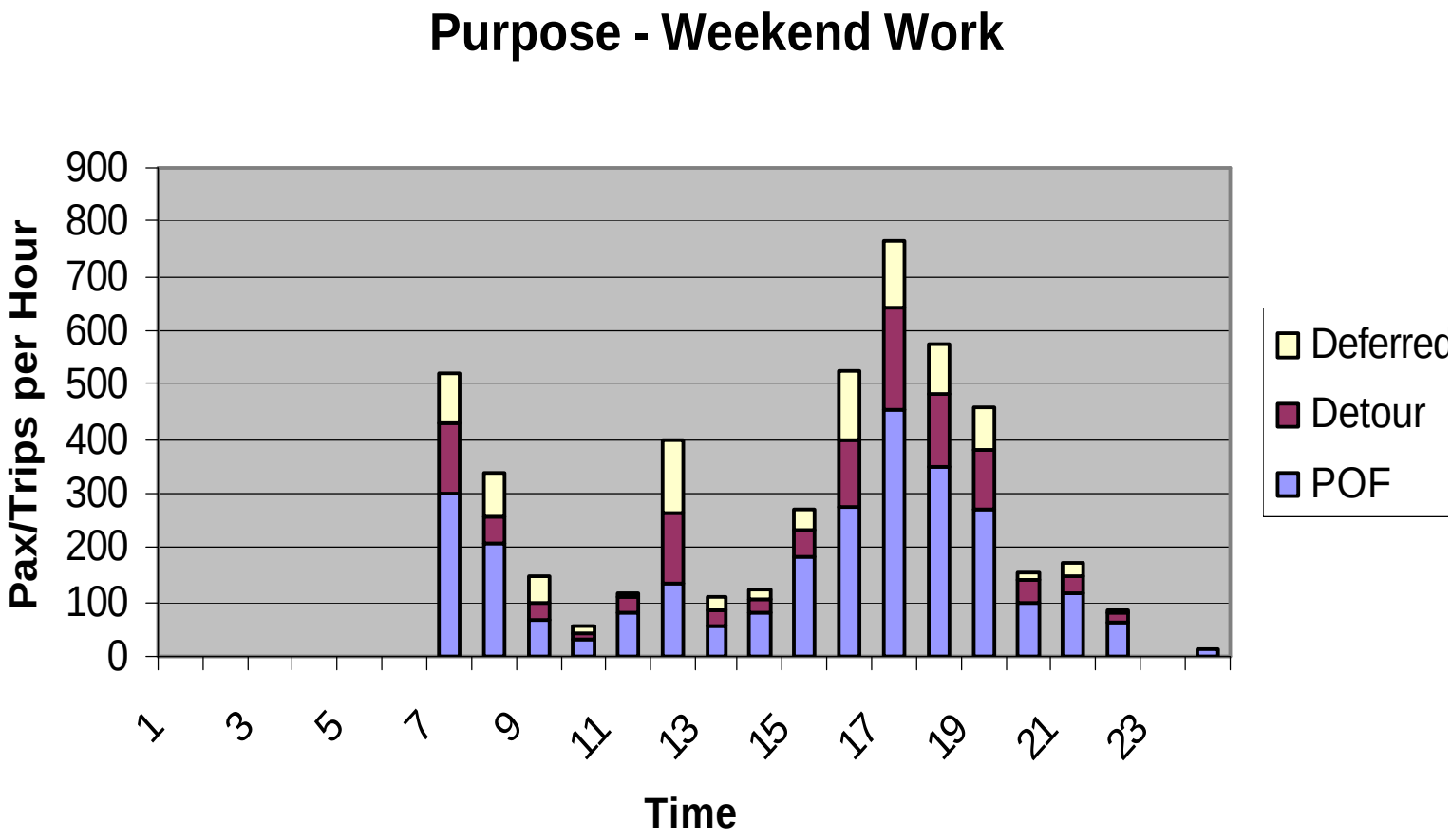

Purpose - Weekend Work
Pax/Trips per Hour
900
800
700
600
500
400
300
200
100
0
1
3
5
7
9
11
13
15
17
19
21
23
Time
Deferred
Detour
POF

Figure A-15

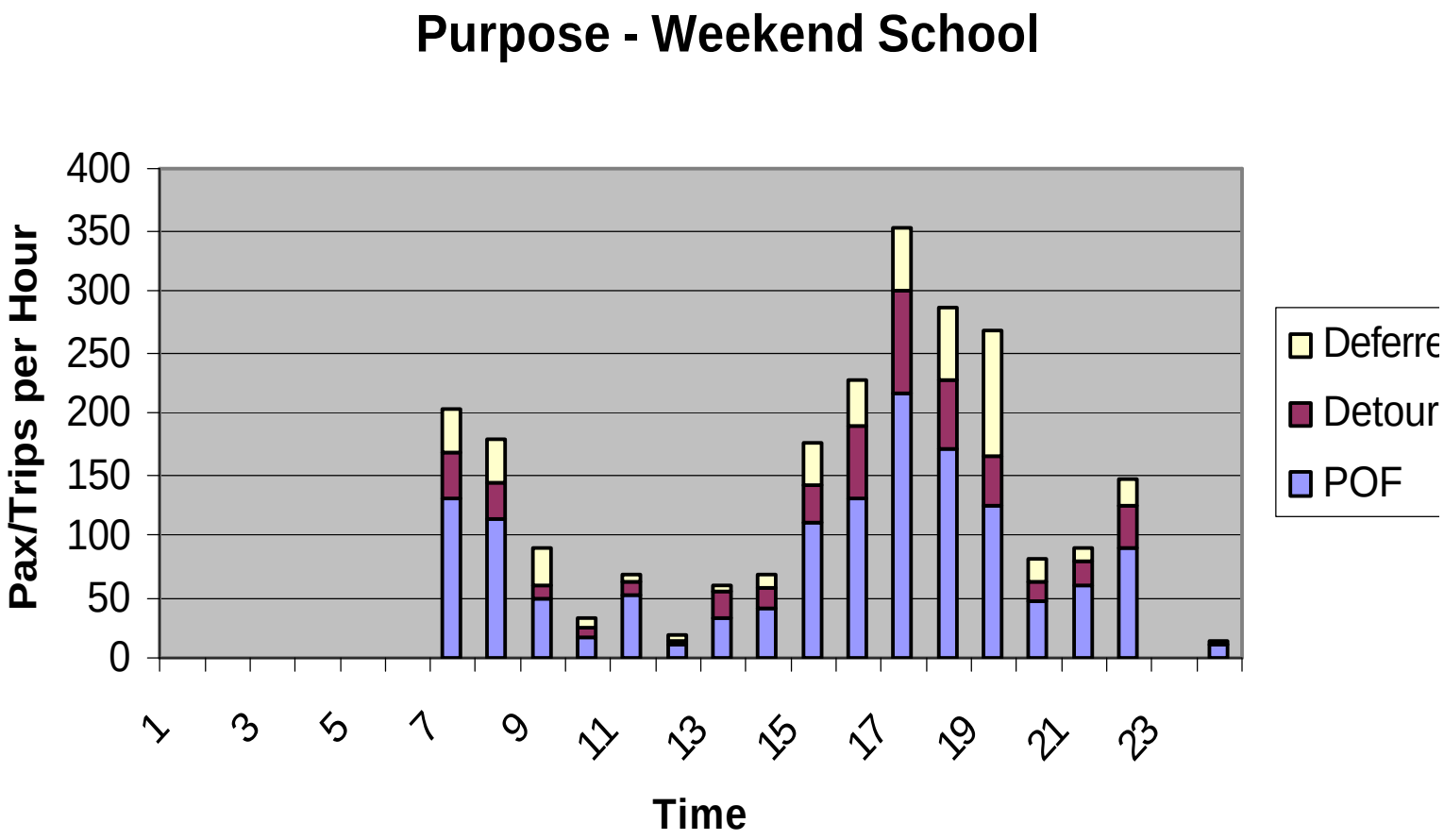

Purpose - Weekend School
Pax/Trips per Hour
400
350
300
250
200
150
100
50
0
1
3
5
7
9
11
13
15
17
19
21
23
Time
Deferre
Detour
POF

Figure A-16

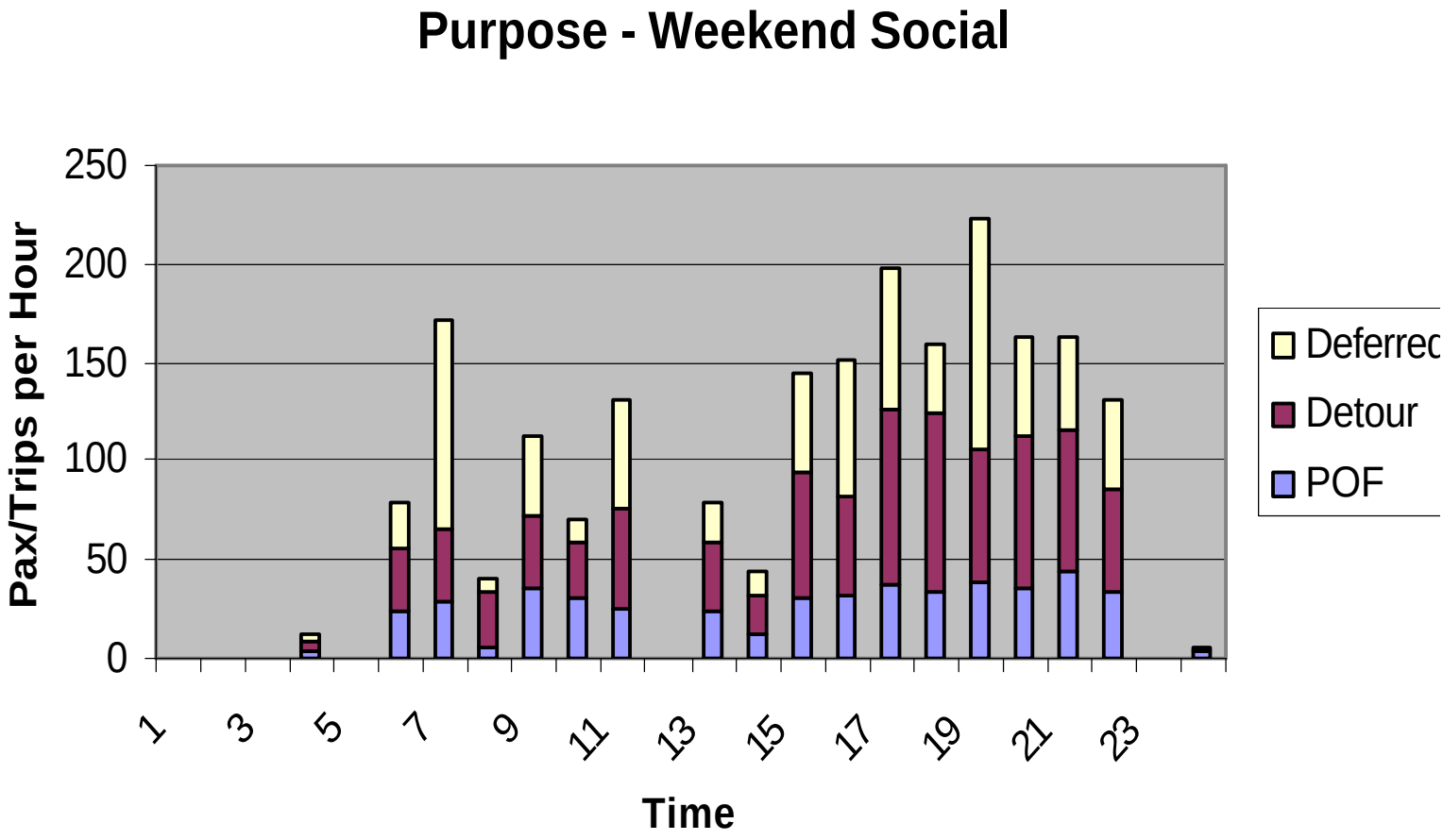

Purpose - Weekend Social
Pax/Trips per Hour
250
200
150
100
50
0
1
3
5
7
9
11
13
15
17
19
21
23
Time
Deferrec
Detour
POF

Figure A-17

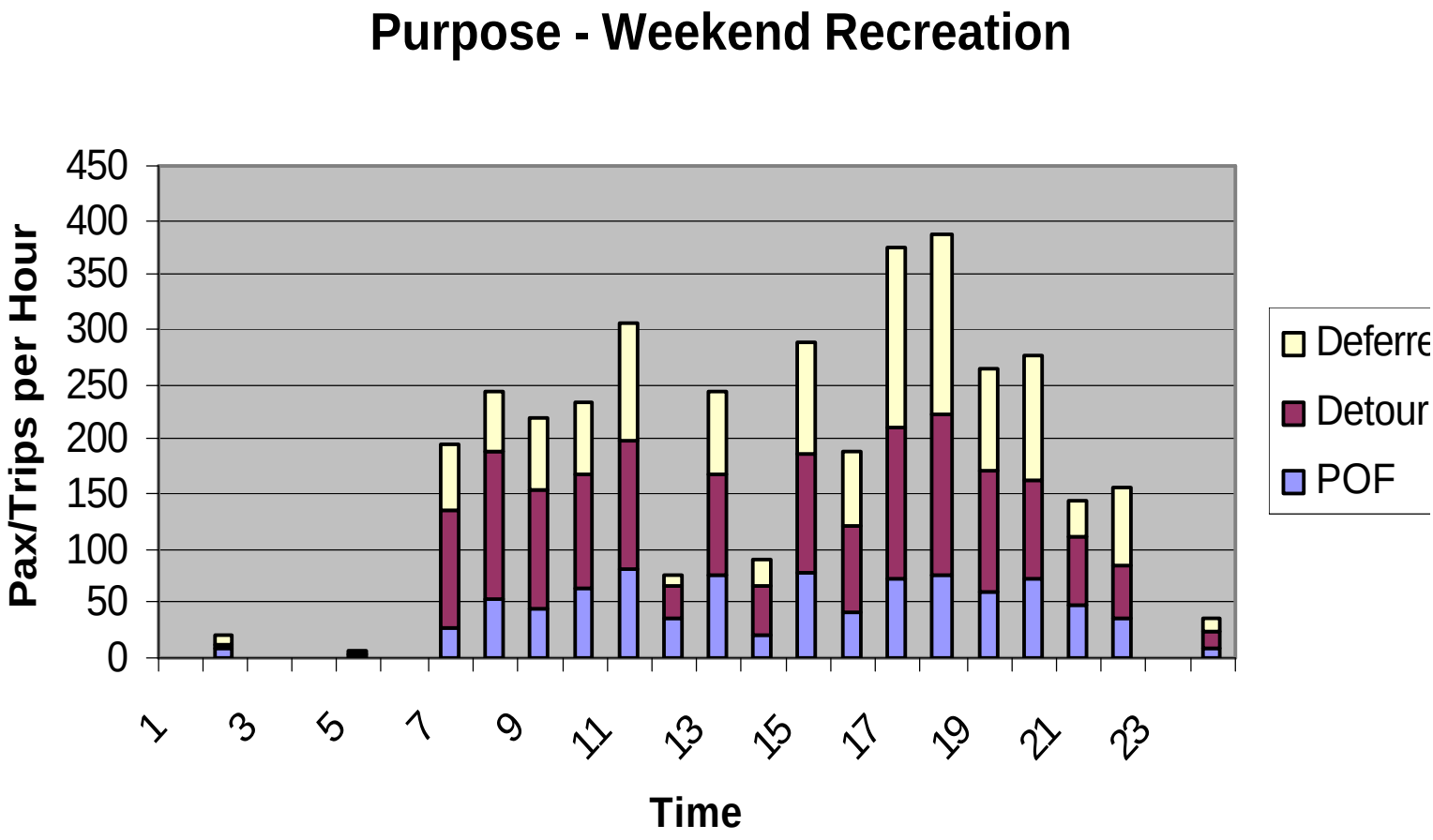

Purpose - Weekend Recreation
Pax/Trips per Hour
450
400
350
300
250
200
150
100
50
0
1
3
5
7
9
11
13
15
17
19
21
23
Time
Deferre
Detour
POF

Figure A-18

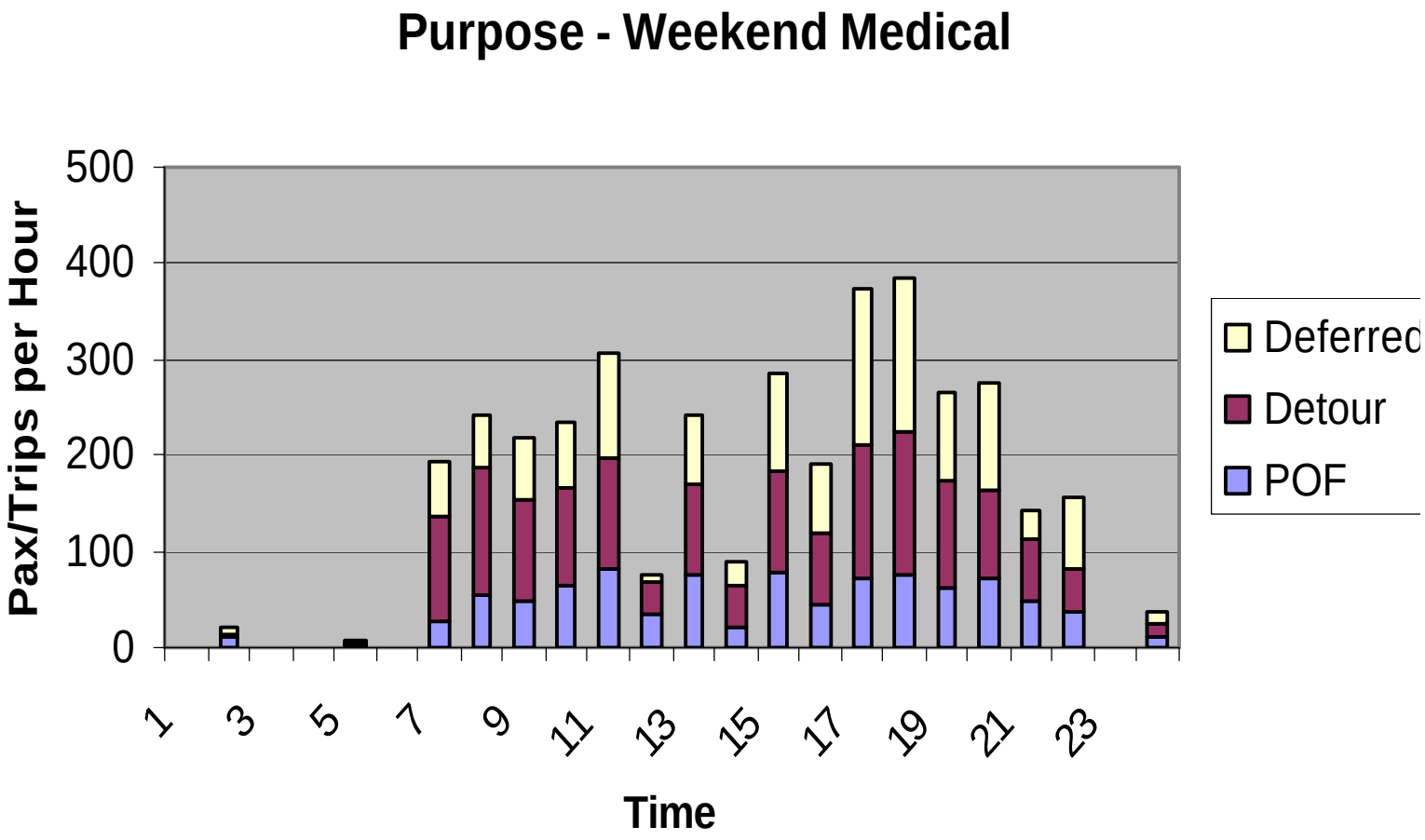

Purpose - Weekend Medical
Pax/Trips per Hour
500
400
300
200
100
0
1
3
5
7
9
11
13
15
17
19
21
23
Time
Deferred
Detour
POF

Figure A-19

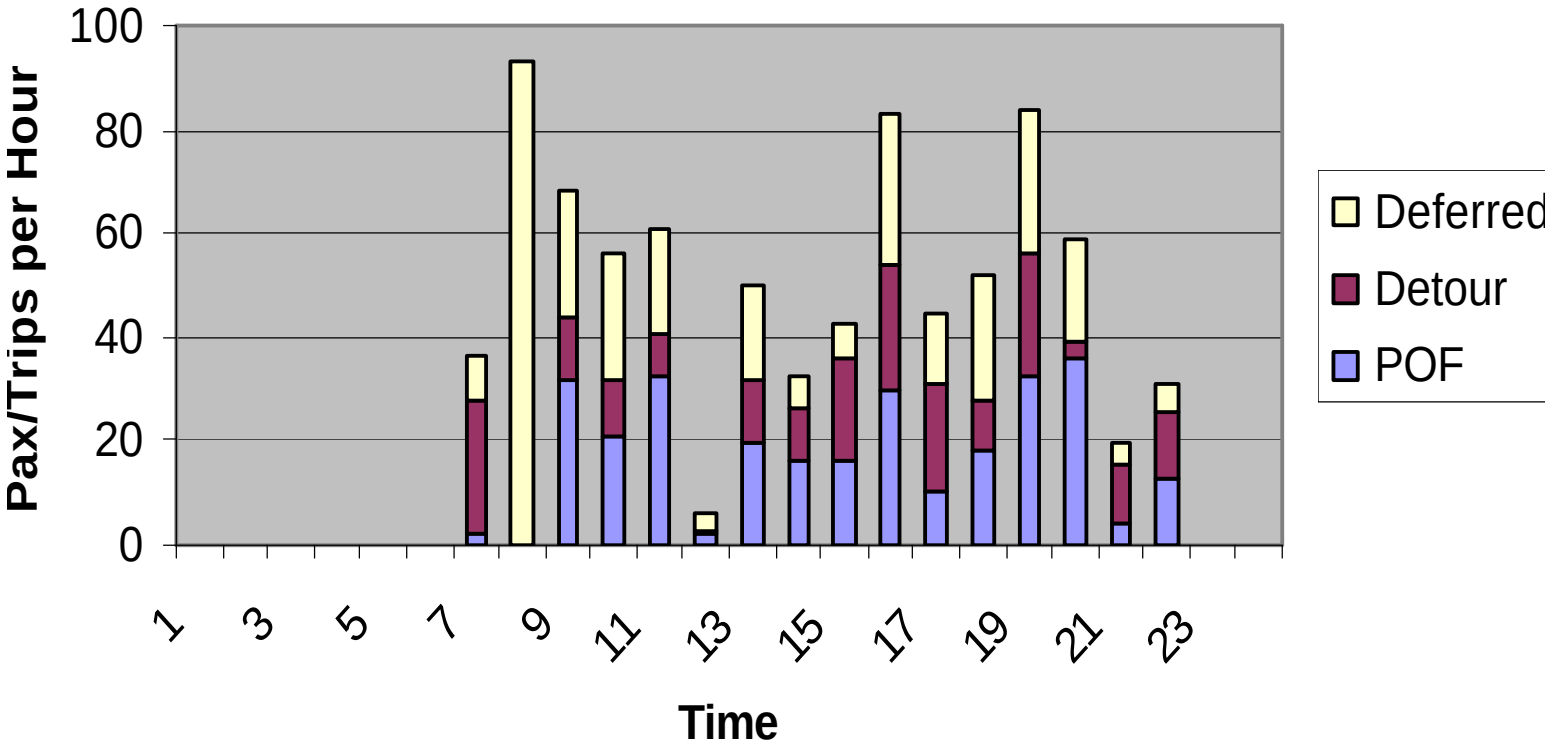

Purpose - Weekend Business
Pax/Trips per Hour
100
80
60
40
20
0
1
3
5
7
9
11
13
15
17
19
21
23
Time
Deferred
Detour
POF

Figure A-20

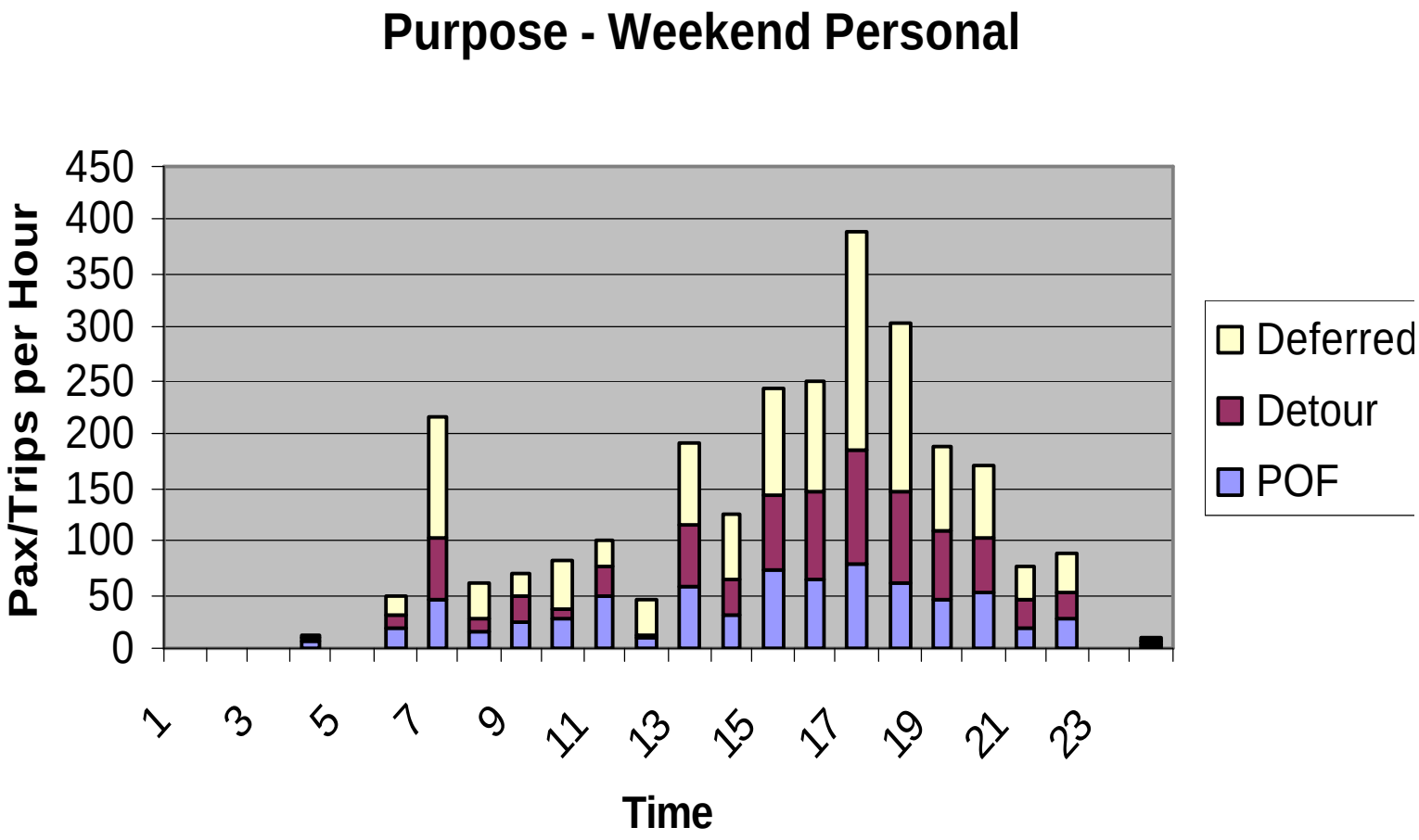

Purpose - Weekend Personal
Pax/Trips per Hour
450
400
350
300
250
200
150
100
50
0
1
3
5
7
9
11
13
15
17
19
21
23
Time
Deferred
Detour
POF

Figure A-21

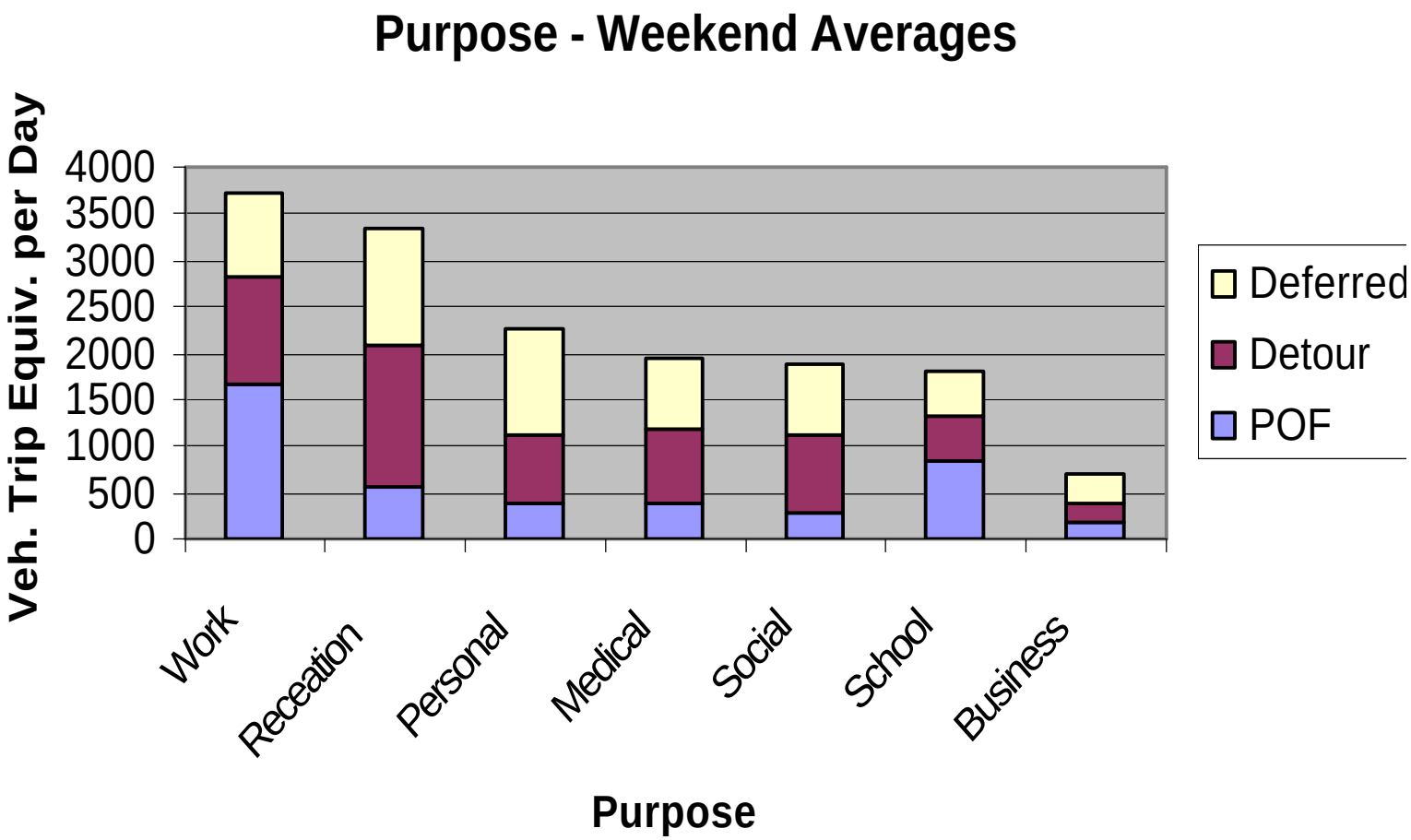

Purpose - Weekend Averages
Veh. Trip Equiv. per Day
4000
3500
3000
2500
2000
1500
1000
500
0
Work
Receation
Personal
Medical
Social
School
Business
Purpose
Deferred
Detour
POF

Figure A-22

Appendix B

Hood Canal Bridge Medical Travel Mitigation Plan

2002 Hood Canal Bridge
Medical Travel Mitigation Plan

April 30, 2002

By

Washington State
Department of Transportation

Olympic Region Planning Office
Corridor Planning Group

Washington State Department of Transportation

Hood Canal Bridge
Medical Travel Mitigation Plan

The Hood Canal Bridge is expected to close as part of a reconstruction project scheduled for 2006. The purpose of this study is to investigate the possibility of mitigating problems associated with the interruption of medical-related travel that takes place regularly over the bridge. An analysis of the current and project situation for a variety of medical trips follows. Although results and recommendations of the analysis are also presented, detailed calculations are omitted here. These are on file at the Region Planning Office.

Data Analysis

The Mitigation Plan identifies alternatives for trips to Seattle,

The total number of medical related trips in 2006 is

Destination Split

Seattle - 75% of trips

or 1801 vpd

Bremerton - 16% of trips or 384 vpd

Tacoma - 4% of trips or 96 vpd

Introduction

The planned passenger ferry at South Point represents a challenge in trip planning to the bridge user, as it involves leaving their vehicles behind. Our method for studying the probable response to this change for non-emergency trips involved determining the total number of medical-related trips expected at the time of construction (gross trips), then deducting the estimated number of trips associated with two categories of behavioral responses to the closure that we identified and studied: detour and telemedicine. The number of trips associated with each of these categories was estimated, and the resulting number of trips (net trips) was used as the basis for formulating a transit-oriented mitigation plan. The mitigation plan for non-emergency trips relies on knowledge gained during the course of the study about medical-related destinations in Bremerton, Tacoma, and Seattle. The plan for emergency trips is based on issues surrounding changes in staffing level due to the need for longer trips.

Gross Non-emergency Trips

The gross number of medical-related trips across the bridge in 2006 is 2402 vehicles per day. This projection is based on results identified in the Hood Canal Bridge Origin and Destination Study (O&D Study), and projections of bridge use based on a recently completed traffic study. This number represents the maximum number of trips that a mitigation plan would need to consider. However, a number of changes in the behavior of bridge users making medical trips are expected to accompany the bridge closure. These changes in behavior are expected to include the use of alternate routes (detours), telemedicine facilities, and alternative transportation (transit services as provided by the mitigation plan).

Destination Split

Accurate and detailed statistics about inpatient medical visits are public and easy to obtain. Outpatient statistics are not generally obtainable. Medicare databases can be used to measure outpatient users of that system, but getting reports of this information is complicated and still only represents a fraction of users. Because there was a reasonable measurement of the total number of medical trips available

in the O&D Study, we used the inpatient data from 2000 as a surrogate for all medical visits, in order to partition the gross number of trips by destination.

Detour Use

Seattle - 90% of trips

or 1621 vpd

Bremerton - 90% of trips or 346 vpd

Tacoma - 92% of trips or 88 vpd

Detour

Three trip destinations (Seattle, Bremerton, and Tacoma) were analyzed to determine the percentage of users currently using the bridge that would most likely use a detour. The detour under study involves driving around Hood Canal using US101 and connecting state routes. The additional time to each destination using the detour route was compared to the duration of trips using the mitigation alternative trip, consisting of the passenger ferry and transit links to one of the three destinations. Detour trip durations were found to be between 12% and 33% longer than the mitigation trips. This increase in duration is small enough that it's assumed to not materially affect the decision behavior of the traveler. Therefore, traveler behavior can be modeled using more generic observations about traveler's choices involving transit.

Results from the 1995 Nationwide Personal Transportation Survey were used to define the detour decision based on trip length. The survey suggests that transit will attract 10% of the Seattle travelers, and somewhat less than 5% of the Bremerton travelers. Since the Bremerton detour utilizes poorer quality roadways (SR106), its assumed that transit will attract somewhat more than this amount, and a value of 10% was used to define the Bremerton transit travelers. Therefore, detour use for both destinations is expected to amount to 90% of the traffic for both destinations. Transit to Tacoma is expected to attract 8% of travelers, but since this results in only 8 passengers per day of demand, Tacoma was dropped from further analysis.

Telemedicine Use

Seattle - 23 vpd

Bremerton - 5 vpd

Tacoma - 2 vpd

Telemedicine

Telemedicine is a technology that uses the internet to allow doctors who are not present to assist in the diagnosis and treatment of patients in remote locations. The technology is intended to be used in cooperation with local, rural doctors. The University of Washington is currently engaged in implementing a grant for installing telemedicine stations in Port Townsend, Sequim or Port Angeles, and Forks. It's expected that by the time the bridge is closed, there will be a significant level of acceptance of this technology. By that time, these installations are expected to accommodate up to 10 visits per installation per day.

Net Trips

Seattle -

236 passengers

Bremerton - 50 passengers

Net Non-emergency Trips

The net number of non-emergency trips requiring mitigation was calculated by deducting the estimated number of medical trips that would use the detour and telemedicine options (as outlined above) from the gross number of trips. An estimated 1.5 passengers per vehicle was assumed in order to calculate the mitigation trip passenger volume by destination. The net trips result is used to establish mitigation transit requirements (see Mitigation Plan below).

Staff coverage mitigation for critical care trips would require the addition of one FTE paramedic in

Critical Care Trips

Based on a survey of the two commercial ambulance services in the region, approximately two critical care, non-emergency ambulance trips use the bridge each day. These trips commonly involve two trained staff members, and represent a significant investment for care providers. These trips cannot be mitigated using transit, so they will use the available detour routes in every case. The increases in

trip durations to common destinations using these detours range from 1.0 to 1.5 hours each way. Based on these data, the average increase in staff absence from duty stations due to the bridge closure would be about 18 hours per week. An additional paramedic FTE, split between Penco and Olympic Ambulance, should be sufficient to mitigate this loss and the risk it represents to effective emergency services.

Emergency Trips

Emergency medical trip mitigation involves adding one Lifeflight trip per week.

Emergency trips originating in Jefferson County that are using the Hood Canal Bridge are bound for the Level III trauma center at Harrison Hospital in Bremerton. Parts of Jefferson County Fire District #3 are within 30 minutes of that facility, and substantially farther from the Level III facility at Olympic Medical Center in Port Angeles. During construction, its expected that some of these trips will divert to Port Townsend (a Level IV trauma center), some to Port Angeles, and some to Seattle via Lifeflight.

Jefferson County Fire District #3, with three full time firefighting staff members, is most affected by the bridge closure because it's the only emergency medical service (EMS) district west of the bridge where transport time to Harrison Hospital is less than that to Olympic Medical Center. Based on conversations with the district staff, the most important issue during closure involves the creation of alternatives for the Harrison emergency trips. These trips presently include a combination of discretionary trips and more critical emergencies that require the Level III trauma center at Harrison. An additional burden to EMS providers during the closure involves those emergency trips currently using the bridge by means of private vehicles. It's likely that many of these will become EMS calls. The less critical of these trips would most likely divert to Jefferson or Olympic. Since data was not available about how many of these private trips would be more critical, an inflation factor of 1.5 was chosen to guide the following discussion about trip volumes.

Of the 23 total emergency trips that would be expected to use the bridge during the closure, only 8 are expected to require airlift. The others are expected to go to Olympic Medical or Jefferson. The trips to Olympic Medical will leave the District short of staff for a longer period than the Harrison trips. It's assumed that this slight increase in staff commitment will not materially affect coverage for the district during the bridge closure. However, see the Critical Care discussion for information about more significant staffing issues related to longer duration trips during the closure.

Mitigation Plan

Transit Trip Requirements

Seattle - Fifteen, six-hour trips per day

Bremerton - Eight, three-hour trips per day

Tacoma – none

Transit Configuration

An informal study of doctor's office and hospital locations in Seattle revealed that two destinations predominate: Capital Hill and UW. Two destinations in Bremerton are also assumed based on the two branch locations of Harrison Hospital. No destinations in Tacoma were considered. This concentration of destinations means that a transit solution is reasonable. An analysis of the trip volumes (see Net Trips section) corresponding to each destination was performed and compared with various transit vehicle schedules and capacities. Net trips results were assumed to be evenly split eastbound and westbound. A maximum one hour headway duration was also assumed for the schedule design. Twenty-

five percent was added to vehicle capacity as a safety factor. The results showed that fifteen, six-hour round trips per day would be required for Seattle destinations, and eight, three-hour round trips per day required for Bremerton. These trips were analyzed to balance the passenger load with the optimum frequency of trips throughout the day, in order to estimate the number of vehicles required.

Advertising

Advertising would be a fundamental component of any successful transportation mitigation strategy. Its assumed that the advertising effort would include websites, newspaper, flyers, and personal visits to providers in Jefferson and Clallam County, all in an effort to familiarize patients and providers about the available options.

Cost

Total Mitigation Plan Costs

$322,600

The cost estimated for providing the mitigation services identified in this plan to travelers who would typically use the Hood Canal Bridge for trips involving medical purposes is $332,600. A breakdown of these costs is shown in Table 1.

The inclusion of these costs in this report means that these particular impacts were recognized during the course of the research, and that mitigation measures were identified. The strategy for how these mitigation measures will be implemented, and how they might be paid for, awaits a more comprehensive study of overall closure impacts.

Table 1
Medical Mitigation Costs

$216,800	Transit
$0	Telemedicine
$40,800	Lifeflight
$15,000	Paramedic staff
$50,000	Advertising
$322,600	Total

Future Work

Corridors where rural, multi-stage transit trips like the ones proposed here have trip durations equal to or less than trips using private vehicles are rare. It's expected that the use of transit opportunities like this by travelers might exceed that found in the NPTS, but we've been unable to verify that hypothesis so far. Increased contact and cooperative activities with medical providers on the Olympic peninsula will be a critical element in refining this medical travel mitigation plan. Many of the people we spoke with in the preparation of this plan had only started to consider the implications of bridge closure on their clients. With the completion of this plan, many of the providers and customers of medical services in the region have begun the process of generating their own ideas about closure impacts and

mitigation strategies, through examination of their unique business needs and relationships to the bridge. An ongoing process involving communication and outreach activities during the planning stage will insure that the best possible mitigation ideas and strategies are considered for implementation. The outcome of this process could have a significant impact on public acceptance of the WSDOT medical travel mitigation effort.